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The Richard Stawell Oration.[1]

THE PHYSICIAN AND THE FUTURE OF CLINICAL SCIENCE.

By C. T. CHAMPION DE CRESPIGNY,
Dean of the Faculty of Medicine, the University of Adelaide.

MY first duty is to acknowledge the honour conferred upon me by the Trustees in inviting me to deliver this oration. My next is to say how diffident I am in addressing you, for I am no orator.

When I was asked to prepare this address, it was suggested to me that with the passage of time those who in years to come render this annual tribute to the memory of Sir Richard Stawell will necessarily be men who have known him only by tradition, and that, therefore, it would be appropriate for those earlier speakers who have been honoured by his friendship to record their observation of his personality and character. But to delineate a truthful picture of even an intimate friend, with whom one has worked and lived in very varied conditions, is hard.

I am chastened by Dr. Johnson's remarks on biography: "It is rarely well executed. They only who live with a man can write his life with any genuine exactness and discrimination; and few people who have lived with a man know what to remark about him." Nevertheless, I shall endeavour to portray my friend as I knew him.

The distinctive quality of Stawell's character was enthusiasm. Whatever he undertook he entered into with an ardour and a passion. He was a man of intense vitality. Tall in stature, his frame was spare and active. His features were delicately moulded,

[1] Delivered at a meeting of the Victorian Branch of the British Medical Association on August 21, 1936.

and his expression, in repose, was austere; but the severity vanished with his ready smile, and he had a most infectious laugh. He had remarkably beautiful hands, finely modelled, with sensitive pointed fingers—the ideal hand for a physician. His articulation was extremely clear and precise. He was a brilliant talker, with rather an impish sense of humour and a ready wit. He took a keen interest in the world around him. His mind was very receptive and never seemed to age, although his immense experience and retentive memory prevented his acceptance of the many ephemeral fashions which are often mistaken for progress in the science of medicine.

This power of analysis and just criticism extended beyond his professional work, so that his opinion was constantly sought by his friends and pupils in many other than merely medical matters. On committees he was usually able to sum up conflicting opinions, and to offer a solution which, as he stated it lucidly and logically, would seem the only possible one.

In his work he was most gentle, imperturbable and exact. His extreme care and keen observation often made diagnosis appear deceptively easy to his pupils; and his bedside teaching was more valuable by example than by precept, although he was a born teacher by the spoken word. It is a mistake, however, to suppose that the delivery of a lecture on a medical subject came easily to him. I think that he always rather suspected a facility that was not based on hard work, constant practice and a minute attention to detail. Certainly the preparation of an address was no easy matter. Every statement had been carefully verified, and he would spend much time in thought and study, and then in writing and rewriting an address before it satisfied him—very often it never did, although it might have instructed and delighted his hearers.

He was a man of great dignity of bearing and courtesy of manner, which made him a natural leader among his associates; but leadership never sat lightly upon him. He recognized that it meant increased work, and he passed on no work to others unless he was sure that it would be well done. This sense of duty—the deep feeling that everything undertaken must be done to the utmost of his capacity—extended even to his pastimes, golf and fly-fishing, which provided an ample opportunity for exercising the same forethought, practice and attention to detail.

No record of Sir Richard Stawell would be complete that did not include a reference to the happiness of his home life. Those of us who were his friends know what it meant to him—how he delighted in his children and all their doings, how well he understood them and entered into their work and play, as if they were the most important things in the world.

His work on active service in the Great War was characteristic of him. He left Australia as physician in charge of a medical section of the Third Australian General Hospital, with the rank of Lieutenant-Colonel. This hospital was the largest medical unit sent from Australia, and had a capacity of 1,050 beds, later extended to 2,000. It was embarked in the P. and O. ship *Mooltan* in May, 1915, and reached London in June. There all its equipment had to be provided by the War Office with additional material purchased through the Australian Red Cross Fund. Colonel Stawell did invaluable and responsible work in attending to a thousand details and in holding innumerable interviews at the War Office and elsewhere. We were ordered to Lemnos to prepare for the Suvla Bay landing, but unfortunately all this mass of equipment was loaded into another ship which did not arrive for weeks after we had landed on that inhospitable shore.

The necessity for preparation was urgent; we had no tents for wounded and sick or for ourselves. Stawell and others scoured the Bay of Mudros in small boats lent by the Navy, and, by good fortune, found some apparently abandoned tents which we secured for our hospital. We had no jetty at which to land our stores, even from small boats. Colonel Stawell, and what was probably a corporal's guard of five or six men, in the scantiest of clothing, worked for hours up to their waists in water, wrestling with rocks and building a jetty fit for our little boats.

Then followed months of work, first of all in caring for the wounded from the Suvla Bay fighting, and later in treating infections such as the paratyphoid fever *A* and *B*, dysentery and infectious jaundice. In this work Stawell was magnificent. In his hands was the control of the medical section of the hospital, which contained nearly a thousand patients suffering from the diseases I have named. These are rare in Australia, and none of us had had much experience of them. Stawell, aided by Lieutenant-Colonel C. J. Martin, his old friend, who was in charge of the pathological section, placed diagnosis on a firm footing. Thus we were soon able to distinguish amœbic from bacillary dysentery, and to recognize the three varieties of enteric fever. Appropriate treatment followed.

Our food was bad, living conditions were difficult, and infection was rife. Of thirty medical officers who landed with the hospital, after two months' time only nine were on duty; the remainder were sick in hospital or had been invalided to Malta, Alexandria or England. Stawell himself fell a victim to amœbic dysentery, followed by infectious jaundice, and after a dangerous illness was sent to England to recuperate. Whilst there, he attended a sitting of Parliament, and I well remember his indignation when he related that in a debate or in answer to a question—I forget which—it was stated that conditions at Lemnos left scarcely anything to be desired. Actually we had just received our first consignment from the Australian Red Cross. On the day of the great blizzard, when the temperature was at freezing point and the wind at sixty miles an hour, we had a generous gift of cotton pyjamas, fly whisks and mosquito netting.

After his return, with colder weather and more regular sea transport providing better food, our health improved and our living conditions were more tolerable. Characteristically, Stawell allowed himself no rest. All the hospital case sheets were collected, and he organized and analysed the clinical records of the medical cases we had treated, amounting to some 5,000. This record, if it is ever recovered from the medical archives of the Australian Imperial Force, will prove a most valuable source of knowledge concerning paratyphoid fever, dysentery and infectious jaundice, comparable to the studies made by Weir Mitchell on the diseases besetting soldiers in the American Civil War.

Stawell's quick mind, enthusiasm, imagination and sympathy made him an ideal comrade; he could understand other people's points of view even when he did not agree with them. His own untiring work stimulated others by example, and his natural optimism and quick sense of humour helped his companions to support more cheerfully conditions which sometimes seemed very hard.

After the evacuation of Gallipoli we sailed for Egypt. The whole personnel and equipment were embarked in the Bibby liner *Oxfordshire*, a very comfortable ship which, compared with our conditions ashore, seemed replete with every luxury.

From Alexandria, Stawell and another senior officer went as an advance party to Cairo to arrange for the establishment of the hospital there. At the time the medical service in Egypt was in a very confused state, and it was mainly his tact and knowledge of human nature, even when found under a "brass hat", that facilitated our being set up in a good site. I can imagine from what he told me, and from what I knew of him, that his method was a combination of courtesy with persistence, reinforced by rather piercing sarcasm for the ineffectual methods of some of the staff at Headquarters.

Early in 1916, owing to reasons of health, he was repatriated. For the rest of the duration of the War he did great work for the sick and wounded who were returned to Australia, and also delivered lectures for the cause of recruiting. His post-war work in connexion with repatriation has already been dealt with by my predecessor, Sir Bickerton Blackburn.

From what I have said I would not have it thought by those who did not know him that Stawell was a man of action only, and that deeds rather than spiritual values mattered most to him. The truth was far otherwise. He had an intense love of the beautiful, whether in nature or in art. Painting and music meant much to him, and he was a very discerning critic in both. The beauty of his own land never failed to delight him, and he knew it well. Many years ago he and I were canoeing on the Yarra near Warrandyte. The river was in flood, and, shooting the rapids, we had upset. After struggling ashore with some difficulty, we found that our canoe was stove in, so we had to face a twenty mile walk. As we went along we talked of many things. Being very young and rather given to metaphysical speculation, and having just read the Ingersoll lectures of William Osler and William James on human immortality, I asked my friend what he thought on the subject. His answer, as I remember it, was that a man was immortal in his works in so far as they affected the lives of others and inasmuch as his memory left its mark on the world that came after him. Often in after years that walk and that talk have been remembered, and I know that Stawell will live in the memory of his friends and in the achievement of his work for medicine in Australia.

His spirit has been caught to a greater or less degree by all his pupils—it is a spirit composed of a love for science and a love for humanity, a hatred for shams and impatience for careless work and inaccurate thinking.

Each of his students, I believe, could say to him the words an old student once addressed to a famous surgeon who had taught him: "You cannot tell how much effect your life has had upon mine. Your influence opened to me a world of living fact, thought and discipline. You, yourself and your words . . . . deeply impressed me. Your teaching became a lasting influence in my life."

It was as one of his clinical clerks at the Children's Hospital that I first met Richard Stawell. He taught both in the out-patient department and in the wards. He was most gentle and understanding with children, who instinctively gave him their confidence. With his students he seemed always to be completely happy, and throughout his life he had a gift of friendship for men much younger than himself as well as for those of his own age. He made a student whom he was teaching at the bedside feel a direct responsibility for the patient under discussion. He must be able to give a good history and to prove that he had made a very thorough examination. There would be a very full discussion by means of question and answer of all relevant points. Although he could be withering in sarcasm, there was never a hurting sting in it, and a pupil always felt that Stawell was interested in him personally, and that if his teacher were severe, it was only to make him work and think better.

His medicine was as scientific as this difficult art can be. His attitude towards it resembled that of Sir James Mackenzie, the cardiologist, and may be expressed by the words of Sir James Paget, who emphasized the value of purely bedside work and its right to be called a science. Paget says:[1]

> I am anxious that all our work should be really clinical; all our chief studies among the living. . . . I think there are even among ourselves signs of a want of faith in the power of clinical research: signs of a too great readiness to reject results and suggestions which are not accordant with our belief in physiology or anatomical pathology; of too great readiness to accept and act upon deductions from any other sciences, though they are not proved by our own. I believe that we shall do little if we do this. Our works will correspond to our faith and be like it, timid and fruitless. We must believe and act on the belief that clinical science is as self-sufficient as any other. Self-sufficient, indeed, no one science can be. All sciences are bound together by common facts and mutual illustrations, and the same cardinal rules of study, yet each, having its own

subject matter, may claim a special range of knowledge, and, within this range, the highest right of judging what is true. This claim we must maintain for clinical science, and justify by the results of our work. . . . After having spent nearly equal periods of study, first in physiology and morbid anatomy and then in practical medicine and surgery, I feel sure that clinical science has as good a right to the name and rights and self-subsistence as a science as any other department of biology; and that in it are the safest and best means of increasing the knowledge of diseases and of their treatment.

We need not and we cannot doubt that in time physiology and an exact pathology will have so far advanced that the treatment of many diseases may be safely deduced from them. But that time is very far distant; and it is not unlikely that we may sooner arrive at larger results by clinical induction. Meantime, seeing that men's lives are committed to our charge, we must do our best in the most direct way that we can; we must not wait for other's help, we must help ourselves with the means that are even now at hand; and these are the means of clinical study. . . .

Receiving thankfully all that physiology or chemistry or any other science more advanced than our own can give us, and pursuing all our studies with the precision and circumspection that we may best learn from them, let us still hold that, within our range of study, that alone is true which is proved clinically, and that which is clinically proved needs no other evidence.

What was spoken by Paget seventy years ago is just as true today, in spite of the enormous growth of the sciences ancillary to medicine; sciences such as bacteriology and radiology were then embryonic or unconceived by the mind of men.

But it is only when practised by men such as Richard Stawell or Joseph Verco, of Adelaide, that clinical medicine becomes nearly a pure science; and even with them it can scarcely be purely impersonal mental activity like astronomy, chemistry or mathematics. In the relationship between physician and patient the intangible and imponderable human element must always play a great and sometimes a dominant part.

There is this difference also. When we name a great scientist we speak of one who has made noteworthy additions to that branch of knowledge of which he is a master. A man may be a great physician without adding to the science of medicine. Indeed, the very nature of his work often hinders him from doing so. His whole time is occupied with the care of the sick, with the close and constant study which the growth of science demands, and with teaching.

Stawell was well aware of this, and used to say that those in practice were the purveyors and users of knowledge, but seldom added to it. For he was not a great contributor to medical science, but he was one of those great teachers like Boerhaave at Leyden and Louis at Paris, and, nearer to our own time, Osler of America and Oxford, who organized medical knowledge, taught with rare skill, enthusiasm and charm, and sent forth true disciples of Hippocrates to many parts of the world to give their best in the cause of medicine.

The problem of research in clinical science is one that has attracted all those interested in the future of medicine. The mass of information available in the literature is beyond the range of any one mind, nor is life long enough to enable one man to obtain experience in all branches of medicine. On the other hand, too narrow a specialization prevents a true grasp of the interrelated disorders of functions in the body beset by disease. Even so-called "team work" does not get over this difficulty. It is this problem which Sir Thomas Lewis has sought to resolve by dividing those who practise medicine into two classes: the practitioner and the medical scientist. The latter is the explorer, while the practitioner exploits the new country which has been surveyed for him. Yet this does not seem to be a thoroughly satisfactory solution. As Mackenzie years ago pointed out, and as he himself so wonderfully exemplified, the man in practice is the person best able to study the natural history of disease as it reveals itself in the lives of individual patients. It is the family doctor who alone has the opportunity of watching separate individuals throughout significant parts of their lives. Certainly, laboratory research alone will never solve most of our problems, whilst the majority of them cannot be solved without the aid that laboratory workers can give to the clinician. Men in active work, whether they are in general practice or physicians, surgeons or specialists, seldom have the time for research, as I have already said. Yet research should be carried out in all our medical schools. The spirit of investigation is the life blood of scientific medicine. These ideas were often in Stawell's mind, and many times we discussed them.

In the Huxley Lecture of last year Sir Thomas Lewis took as his subject "Clinical Science within the University", and he concluded his address with these significant words:[2]

It is my conclusion that it is largely within the power of our universities to establish the branch of work which studies disease in living people as a science, by removing the obligation to engage in and teach the practical art, and by treating clinical science on precisely the same basis as the allied sciences physiology and pathology are treated, thus bringing all the work into real harmony.

The maintenance of equilibrium between these three may then be left with confidence to the interplay of individual and general needs, and to the mutual sympathy that is natural to any corporation of enlightened people working to a common end.

In our medical school in the University of Adelaide the question of research in clinical science has much occupied our thoughts, and within the last few years a plan has gradually evolved for which we have great hopes. It is as follows. The Laboratory of Pathology and Bacteriology of South Australia, which is under the control of the Board of Management of the Adelaide Hospital, does a very large amount of work not only for the Adelaide Hospital, but also for the various public health bodies, the Stock Department, private practitioners, agriculturalists *et cetera*.

Thus an immense number of investigations are carried out in all branches of human and stock diseases requiring laboratory technique for their diagnosis and treatment. In order to make use of this laboratory to the fullest extent for research purposes, and to correlate its work with that of the

university departments, we have planned the building of an Institute of Clinical Science in which various aspects of disease may be studied and teaching carried out.

The university and the hospital have combined in appointing as Director, Dr. Weston Hurst, of the Lister Institute of Preventive Medicine, a medical scientist who, keenly alive to the clinical importance and application of the work carried out in the laboratory, will be no less interested in the problems which in the wards of the hospital constantly present themselves to the practising physician and surgeon.

He will have on the one hand, the opportunity of coming in contact with the work of the wards, and on the other, that of the Institute of Clinical Science. Thus, with adequate assistance in both spheres of work, we hope that he will be able to organize the forces under his control so as to plan definite campaigns of investigation.

By the generous monetary gifts of friends to medical science in Adelaide—Miss Edith Bonython, Mr. Norman Darling and Mr. Tom Barr Smith—to which the Government of South Australia has added an equal sum, the building of an Institute of Clinical Science has been made possible. Under one roof we shall house the Laboratory of Clinical Science, the University Departments of Pathology and Bacteriology and part of the Department of Physiology. Thus we shall have grouped together those activities of the Medical School which, apart from bedside work itself, have most to do with medicine and surgery.

The general hospital and the university are separated only by a roadway. The new institute will be situated in the grounds of the hospital facing the university. Thus it will be convenient to the wards and departments of the hospital on the one hand and to the pre-clinical departments (anatomy, physiology, biochemistry and chemistry) in the University on the other. Near at hand also is the Nutrition Laboratory of the Stock Department of the Council for Scientific and Industrial Research.

The control of the Laboratory of Clinical Science is vested in a committee representing the University of Adelaide and the Board of Management of the Adelaide Hospital. The Sheridan Bequest for Medical Research in the University of Adelaide provides half the stipend of the Director and the South Australian Government the other half.

It is stated in the terms of the Director's appointment that he shall engage in the investigation of and research into human disease.

For the purpose of investigation he will, with the medical officers in charge of each patient, have access to patients within the Adelaide Hospital for the purpose of making observations and of instituting research by controlled experiment in all facts relevant to the inquiry in hand. Thus he will be able to conduct research, clinical as well as extra-clinical, into groups of patients presenting similar diseased conditions, or into some individual case selected for a particular reason.

A very important feature of this plan is the coordination of the work of the Director with that of the hospital staff and of the other departments contained in the institute.

The value of such a close association between various departments of a school of medicine should be obvious. The minute study of certain aspects of disease processes may throw light upon normal function.

Thus it is that medicine has in the past made great and valuable contributions to the science of physiology. Such practical applications must occur to you all. Neurology, for example, abounds in them; Hughlings Jackson's prophetic insight into nervous function and its relation to structure was based almost entirely upon his searching studies of clinical phenomena and his philosophical interpretation of symptoms.

I may here cite an example to show how the study of a rare disease may contribute to the elucidation of a normal physiological process—so thoroughly investigated a function as muscular contraction. Recent work by Dale and others goes far to prove that muscular contraction is due to a nerve impulse, causing, in the neighbourhood of a motor end-plate, the formation or liberation of a substance—acetylcholine in the case of certain nerves and adrenaline (or a substance resembling it) in the case of certain other nerves. When the nerve impulse ceases, the "effector" substance is rapidly destroyed by esterase, a normal constituent of blood and serum.

A patient of mine in the Adelaide Hospital was afflicted with *myasthenia gravis*, in which disease, of course, the power of muscular contraction is profoundly lessened or abolished. Sir Stanton Hicks, Professor of Human Physiology and Pharmacology in the University of Adelaide, assisted by Miss M. L. Mackay, carried out an investigation into the esterase content of the blood of this patient. Using the isolated frog's heart as a test object, they found that the blood of the myasthenic patient is richer in esterase than normal. The heart was perfused with standard dilutions of acetylcholine to which the serum was added, and the time taken for recovery of inhibition, that is, destruction of acetylcholine, was measured.

At no time during the investigation, which covered five months, did the blood of the patient show anything but excessive esterase activity, which increased with the severity of the disease, and diminished with treatment by prostigmine injection. Samples taken under unknown clinical conditions accurately indicated the relative severity of the disease.

The same result was obtained when the esterase was set to resynthesize acetylcholine from its constituents in the presence of acetic acid. The patient's serum showed more esterifying power when the resulting inhibition on perfusion was measured by the same heart technique. Prostigmine was found to inhibit both hydrolytic and esterifying phases of esterase activity.

The conclusions put forward are subject to the reservation that only one case has been studied, but this is offset by the fact that during the whole five months, at weekly intervals, the results have been always the same. This supports the hypothesis that abnormally high esterase activity is associated with the condition termed *myasthenia gravis*, and that it may be a causal factor in preventing normal nervous stimuli from being effective, on the assumption that response follows the building up of adequate concentration of acetylcholine at the motor end-plate.

Thus a valuable cross-bearing observation was made relating to a physiological theory of wide and important applications.

In clinical research a most important part may be played by the practising clinician in the recognition of problems. He must be alert to the significance of symptoms in their relation to normal function. Symptoms and signs of morbid processes should challenge him to interpret them in terms of physiology and biological chemistry. It is only thus that a true conception of living pathology may be reached.

Unfortunately, the time necessary for the intensive study of these problems is seldom at the command of the clinician; but we hope in some measure to surmount this difficulty. By organizing the resources of the various departments of our institute we may help the clinician by endeavouring to solve the questions presented to him in the wards by whatever method or combination of methods seems the most promising and appropriate to the problem in hand.

We do not think it wise that the Director should be occupied by routine teaching. His time will be more usefully spent in research and in the planning of coordinated investigations. We hope that he will gather around him workers desiring to take up some special line of clinical inquiry or graduates seeking practical experience in some particular branch of study. The institute is to be fully equipped for such research and post-graduate workers.

We feel, too, that the free and intimate and informal association of the staffs of the various departments contained within the institute will be a valuable intellectual stimulus.

We hope to make it to some extent a clearing house for medical science in South Australia. Here I am thinking particularly of the medical men in the country. Many of them are keenly interested in recent developments in their work, but are too cut off from their fellows to receive the incentive to their enthusiasm which contact with those of like interests gives. They will be encouraged to discuss problems and relate observations and to ask for guidance and help in any fruitful subject for investigation in their sphere of work.

Dr. L. B. Bull, a doctor of veterinary science, Director of the Department of Animal Industry in the Council for Scientific and Industrial Research, whilst he was Director of our laboratory, showed us by his wide and deep knowledge of disease processes how valuable is a knowledge of comparative pathology. For this reason we feel it is a great advantage that the institute will have a section for veterinary pathology which will carry out work for the Stock Department of the South Australian Government.

Here it is interesting to note that the University of Cambridge is establishing the post of Assistant Director of Research in Medicine. The person appointed will devote his whole time to the organization and conduct of clinical research at Addenbrooke's Hospital and in the laboratories of the university under the direction of the Regius Professor of Physic.

In his earlier investigations, Mackenzie was surprised at the lack of precise information regarding the course, evolution and duration of various forms of heart disease. He was emphatic in his opinion that it is the family doctor who can best supply this information, and in many respects Mackenzie was right.

But in these days practices change hands more frequently than forty or fifty years ago, whilst patients seem to be less constant in their allegiance to one practitioner. In country districts one man may know over a period of many years all the people in his district, but usually in such cases the population is too small to offer sufficiently large groups of different disorders suitable for significant observations.

There is no doubt that we need carefully compiled records collected continuously over adequate periods of time which will give us information as to the natural history of the more important human disorders as they occur in Australia. Most of our information on this subject depends upon recorded observations in Europe and America, where conditions in regard to race, occupation, nutrition and climate are not altogether comparable with those in our own land. In respect to cancer and tuberculosis, such work is being more or less adequately carried out by the numerous organizations which deal specially with these diseases; but, in regard to other forms of serious disease, a great deal of useful information remains to be acquired.

We need records of the histories of large numbers of patients extending over sufficient periods so that we may obtain knowledge of the effects of acute illness and of infections on the subsequent health of the patient, that we may assess the ultimate value of various forms of medical treatment and surgical procedures, and, above all, that we may gather information in reference to the evolution of such chronic maladies as rheumatic infection especially in regard to the heart, in reference to diabetes especially in the young, in reference to chronic nephritis, the various forms of arthritis and many other conditions which must readily occur to you. Such a study may reveal hereditary and environmental factors influencing the course of the malady and features in its earlier manifestations which exert important influences upon its subsequent evolution.

In Adelaide we are in a rather favourable situation for making such studies. We have a

population of moderate size, and the Adelaide Hospital is the only general hospital. There is not a large shifting population. It should be possible, therefore, to undertake systematic observation on cases of the kind already mentioned, and to compile records extending over years. This will, of course, need organization; but in time I feel sure that such a work undertaken by the institute should prove of great and lasting value. From it could be built up a volume of knowledge which would be an accurate picture of the course and frequency of various morbid conditions, primarily for South Australia, but applicable in all probability to most other parts of the continent.

In regard to conditions found *post mortem*, Dr. Cleland, our Professor of Pathology, has already documented the results of more than 3,000 autopsies showing the sequence and especially the correlation of various morbid states. This work is a valuable source of information concerning the frequency of incidence of infections such as tuberculosis, degenerations and chronic disease, the site and spread of cancer *et cetera*. Many interesting facts have emerged from this analysis, which we hope Professor Cleland will place on record.

The difficulties besetting the man in active practice which prevent him from organized investigation may thus, we hope, be largely overcome. The medical staff will have the opportunity of discussing its problems with the Director, whilst in work which may require the observation of a number of examples of some particular malady, the large number of patients passing through the hospital will surely afford more cases than can come to the personal experience of any one man in the course of his practice. It is this concentration of effort on definite disorders or groups of disorders which offers the best chance to advance knowledge at the present time. Most of the diseases to which human flesh is heir, have been discovered. Those that are not must be so rare as to be of little practical importance, except as varieties to add to the collections or museums of the morbid anatomist. But it is to the intensive study of the common killing or crippling diseases that we must look for help in advancing our art. Already Mackenzie and Lewis have shown us what such study spread over the last forty years has done in elucidating the disorders of the heart and the peripheral circulation. How hæmatology has been advanced by Whipple, Minot, Murphy, Castle and Witts! So we hope that by planning definite campaigns and concentrating upon them we may to some extent succeed in adding even a small brick to the structure of our science. Even if we do not succeed in so doing, the attempt seems well worth while. We feel that in establishing a centre for research under able and enthusiastic guidance we shall inspire our students and graduates with a desire to devote part or the whole of their lives to the unravelling of the tangled skein of human illness.

This development in our medical school is one in which I know Sir Richard would have been deeply interested; indeed, we had discussed such an idea many times, and it has followed to some extent the lines of his thought. He believed always in the use of laboratory work and understood its technique, value and limitations, for soon after graduation he studied bacteriology when it was in its infancy, and later, about 1906, he worked with Sir Almroth Wright at St. Mary's in London. It was this intimate knowledge which enabled him to use it critically, apportioning the just balance between clinical and laboratory evidence. His continued interest in the work of his friend, Dr. Kellaway, and his associates at the Walter and Eliza Hall Institute must be known to most of you.

I have tried, very inadequately I fear, to paint the picture of a great physician. I have spoken of the future of clinical science because it is a subject which must greatly be the concern of all who devote their lives to the care of the sick, and because to it Sir Richard Stawell gave all those great gifts of heart and mind with which he was so generously endowed.

Finally, may I add the words of a German philosopher: "A great man places upon posterity the duty of understanding him."

References.

(1) Stephen Paget: "Memoirs and Letters of Sir James Paget", pages 243 and 244.
(2) Thomas Lewis: "Huxley Lecture: Clinical Science within the University", *The Lancet*, March 30, 1935, page 723.

RESULTS OF TREATMENT OF ANTRAL INFECTIONS: AN ANALYSIS OF CASES.[1]

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The treatment of antral infections invariably creates fear and lack of confidence in a patient's mind. Further than this, there are not a few general practitioners who advise their patients to have nothing done for an antral infection. This indicates a deplorable lack of confidence in rhinologists, or a lack of knowledge of the lasting benefits to be obtained from persistent conservative treatment.

Recently several medical colleagues, victims of an acute antral suppuration, have asked me the question: "What percentage of these recur?" At a recent British Medical Association meeting in Melbourne Leonard Johnston drew attention to the criticism by the public of antral operations, and suggested that too many radical operations were being performed.

A Questionnaire.

Hoping to reassure myself and others on these points and to answer some of these questions, I have

[1] Read at a meeting of the Ear, Nose and Throat Section of the Victorian Branch of the British Medical Association on July 20, 1936.

sent the following *questionnaire* to all private patients treated in my practice in the past six years for proved antral suppurations, that is, those from whose antra mucopus was obtained on lavage.

Have you had any of these symptoms since your treatment:

Post-nasal discharge?.....
(If "Yes", is it yellowish or just mucus?.....)
Repeated colds?.....
Nose blocking?.....
Chronic cough?.....
Bad smell in nose?.....
Headaches?.....
Any other symptoms?.....

Was your treatment: (Cross out two.)
Totally successful?
Partially successful?
Totally unsuccessful?

Any other remarks.....

Two hundred and twenty patients were circularized, and one hundred and seventy-eight replied. The replies are summarized in the accompanying table.

Clinically, the only clear differentiation is between acute antral infection and latent or chronic infections. I prefer the term "latent" because, as I shall attempt to show, many allegedly chronic infections are latent and easily removed by conservative therapy.

For the purpose of this investigation cases in which the patients give a history of trouble of less than two months' duration are classed as acute, whilst those of more than two months' duration are classed as latent or chronic.

The principles on which treatment has been based might be stated before proceeding to an analysis of replies to the *questionnaire*. An antral infection can cause pathological changes in the mucous membrane, mechanical changes in the ostium and accumulations in the lumen. Nature relies on ciliary action to remove secretions via the ostium. Our treatment aims at restoration of ciliary action. Lavage acts by removing the load on the cilia and reestablishing the patency of the ostium, whilst the power of recovery of mucous membrane is amazing. Acute infections have been treated by repeated lavage, and in only four has a subsequent operation been indicated, two of these being dental infections.

Endonasal antrostomy has been performed when it was believed from the clinical and X ray evidence that the mucous membrane was able to recover with efficient drainage. This group also includes patients debarred from repeated lavage by nervous and geographic considerations. It also includes patients for whom at the present time I would advise repeated lavage.

The radical antrum operation referred to in this paper was invariably the Caldwell-Luc operation, or the extended Jansen-Horgan operation, and included complete and thorough removal by elevation of the whole antral mucous membrane. This operation was performed only when examination of the mucous membrane suggested that it was diseased beyond hope of recovery.

Analysis of Replies to Questionnaire.

Acute Antral Infections. Of the group with acute antral infections fifty-four patients replied. All but two infections followed an acute upper respiratory infection; the two exceptions followed extraction of a tooth. All cases were proved by the evacuation of mucopus on lavage, and all patients were treated by lavage once, twice or thrice a week until there was no macroscopic evidence of infection.

In some cases solutions such as argyrol, "Neosilvol", paraffin oil, were injected after lavage, but no appreciable difference was noted in the response as compared with simple lavage.

Graph A indicates the number of washes performed. It will be noted that the majority of patients required one to four washouts. At least eighteen cases of blocked ostium were noted.

Thirty-six patients (66%) declared their treatment totally successful, fourteen (27%) declared it to be partially successful, whilst in four (7%) instances treatment was unsuccessful in that a subsequent operation became necessary. Of the last-mentioned infections two were of dental origin.

Latent Antral Infections Treated by Lavage. Of the patients with latent antral infections treated

Table I.

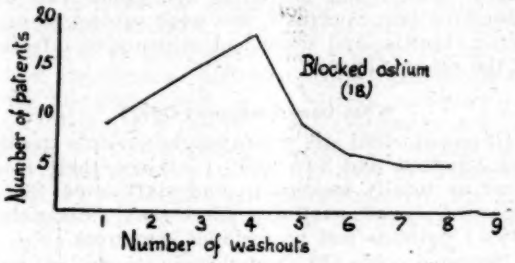
	Acute Infections Treated by Lavage.	Latent Infections Treated by Lavage.	Endonasal Antrostomies.	Radical Operations.	Grand Total.
Number of cases	54	67 (44)[1]	36	48	178
Totally successful	36 (66%)	27 (40%)	16 (44%)	23 (47%)	102 (56%)
Partially successful	14 (27%)	14 (20%)	18 (25%)	22 (47%)	67 (38%)
Totally unsuccessful	4 (7%)	26 (40%)	2 (6%)	3 (6%)	9 (6%)
Subsequent operations	4	23			
No symptoms	22	21	11	41	68
Post-nasal discharge:					
Mucus	17	13	7	19	36
Yellow	5	5	10	14	34
Repeated colds	4	4	6	5	19
Nose blocking	11	9	13	13	46
Chronic cough	3	3	3	7	16
Bad smell in nose	2	2	4	4	12
Headaches	8	4	6	1	19

[1] This number, 44, represents those treated by lavage only.

by lavage sixty-seven replied. Forty-four were treated by lavage only, whilst in twenty-three instances a subsequent operation was indicated. Of the forty-four patients not operated on, twenty-seven (60%) claimed that treatment was totally successful, fourteen (33%) said that it was partially successful, and three (7%) that it was totally unsuccessful.

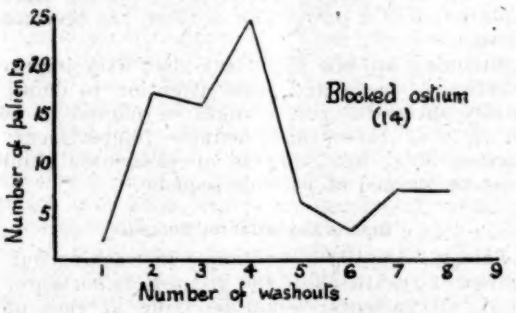
Thus out of sixty-seven patients in whom lavage was used as a preliminary treatment, twenty (40%) were totally cured, in fourteen (20%) the treatment was partially successful, and in twenty-six (40%) it was totally unsuccessful.

It is of interest to note that there were nineteen children under the age of fourteen in this group, of whom nine (48%) were successfully treated; in four (21%) treatment was partially successful, and in six (31%) it was quite unsuccessful. Five of the last-mentioned group of six patients subsequently underwent endonasal antrostomies.



Graph A.

Graph B indicates the number of washouts performed, and is similar to Graph A. Fourteen examples of "blocked ostium" were noted.



Graph B.

Latent Antral Infections Treated by Endonasal Antrostomy. Of the group of patients with latent antral infections treated by endonasal antrostomy, thirty-six replied. In sixteen cases (44%) treatment had been totally successful, in eighteen (50%) it was partially successful, and in two (6%) it was totally unsuccessful.

Latent Antral Infections Treated by Radical Operation. Of the patients with latent antral infections treated by radical operation forty-eight replied. In twenty-three cases (47%) treatment had been totally successful, in twenty-one (44%) it was partially successful, and in three (9%) it was quite unsuccessful.

Thus out of a grand total of one hundred and seventy-eight patients, one hundred and two (56%) stated that the treatment was totally successful, sixty-seven (38%) that it was partially successful, and nine (6%) that it was totally unsuccessful.

Consideration of Partially Successful Cases.

Careful perusal of patients' replies indicates that their statements as to total or partial success are inconsistent. Many of the patients in the "totally successful" group admitted to some degree of excessive post-nasal mucus, and others were troubled with nose blocking. Apparently they were satisfied that these symptoms were mild enough to be negligible and perhaps due to other causes. On the other hand, in some of the "partially successful" cases negligible symptoms were registered.

Returning to the analysis, it will be noted that the commonest symptoms complained of were excessive post-nasal discharge, and nose blocking. I suggest that the time has passed when all people who complain of these symptoms should be regarded as victims of sinusitis.

In this series of cases the commonest causes of unsatisfactory results after antral treatment were: (i) vasomotor rhinitis, (ii) hypersensitive state of the nasal mucosa, (iii) asthma, (iv) bronchiectasis, (v) associated fronto-ethmoidal and sphenoethmoidal sinusitis, (vi) atrophic rhinitis.

Vasomotor Rhinitis.—A large proportion of the partially successful cases belonged to this class. Vasomotor rhinitis is still the bugbear of rhinology. The antrum is the scapegoat for all nasal discomforts. How common it is for the subject of vasomotor rhinitis who has had an antral infection to exclaim: "Oh, it is that antrum of mine again; there is no cure for it." It is most important to recognize the hypersensitive or vasomotor nose at the first examination. These patients tolerate operations very badly, and provide the majority of unsuccessful results. Conservative treatment is especially to be prolonged in them, and, if necessary, allergic factors should be excluded.

Hypersensitive Nasal Mucous Membranes. Many patients, although not victims of hay fever or vasomotor rhinitis, nevertheless possess mucous membranes which respond abnormally to stimulation. City dwellers among this group react to the impure city air containing particles of smoke, noxious gases, street dust, central heating *et cetera*, and eventually reach a more or less permanent state of nasal over-secretion. Psychopathic patients are also very poor subjects for operations, and must be selected with great care. Invariably they have hypersensitive nasal mucous membranes or have some degree of vasomotor rhinitis. The best results in the above patients are obtained when gross pathological change is evident in the antrum.

Asthma. Two patients with asthma reported no further attacks, one after endonasal antrostomy, one after radical operation for advanced polypoid

disease. The former was always relieved for some weeks by lavage, but the condition recurred when secretion collected in the antra. Three patients described their result as totally unsuccessful after radical operation. Lavage relieved many patients, and in no instance did harm. It was of particular benefit to children.

Bronchiectasis. Cases of bronchiectasis are not likely to give completely successful results.

Associated Fronto-Ethmoid and Spheno-Ethmoid Infections. In my hands, fronto-ethmoid and spheno-ethmoid infections are not a common occurrence, and after efficient antral therapy they all tend to subside spontaneously. The rôle of antral therapy in the treatment of frontal sinusitis will be subsequently discussed.

Patients Treated by Lavage.

Of the fourteen patients with acute antral infection whose treatment was classed as partially successful, it was evident that six required further treatment; two were admitted allergics.

Of the sixty-seven patients with latent antral infection, twenty-three required a subsequent operation. Among the other forty-four there were three whose treatment was totally unsuccessful, but they were not operated on. One was a child with a severe vasomotor rhinitis and there was no evidence of residual infection by washout or symptoms. Another was an asthmatic who reported improvement for several months after two washouts followed by recurrence, but obviously needed further washouts. The third complained only of post-nasal mucus, and believed the trouble was due to "nervous dyspepsia".

Of the fourteen whose treatment was partially successful, seven gave evidence of a hypersensitive or vasomotor factor, and three obviously had insufficient treatment.

Cases Treated by Endonasal Antrostomy.

Of the thirty-six patients treated by endonasal antrostomy, eighteen reported that the treatment was partially successful, and two that it was totally unsuccessful. In the last-mentioned group an error of judgement was made in the type of operation selected. In one case, in spite of very large permanent endonasal openings, the mucous membrane had become progressively more diseased after six months, as estimated by X ray examination and inspection via the openings. This patient refused removal of the mucous membrane.

The same criticism might be made in seven of the eighteen partially successful cases. Four of the patients were children and the endonasal operation was performed because of the possibility of interference with dentition. Eight patients were greatly improved in health, but still had some residual symptoms. One patient was suffering from severe vasomotor rhinitis. Closure of the opening was a fairly common cause of dissatisfaction in children. This occurred in spite of the fact that I always made a very large opening by removing the naso-antral wall from front to back and from the floor up to the insertion of the inferior turbinate bone. This trouble is only to be expected when one considers the machinery present in a child in this region for the manufacture of new bone.

Thus, in my hands, the endonasal operation, although carefully considered and given a fair trial, has been a cause of anxiety. First, it is possible that lavage will cure those which are cured by this operation. Secondly, one speculates on the power of recovery of the mucosa. Moreover, Hilding has shown that in spite of a naso-antral opening, ciliary action still removes secretions via the normal ostium.[1]

Patients Treated by Radical Operation.

Of forty-eight radical operations, three were totally unsuccessful and twenty-one were partially successful. In the three totally unsuccessful cases the patients were all asthmatics. Of the twenty-two patients in whom the operation was partially successful, eleven had negligible symptoms, two had associated bronchiectasis, five were subject to vasomotor rhinitis, and seven had evidence of infection of the other sinuses.

What Does Treatment Offer?

Of one hundred and seventy-eight patients treated, one hundred and two (56%) classed their treatment as totally successful, and sixty-seven (38%) regarded it as partially successful. Sixty-eight (38%) patients had no residual symptoms.

Repeated colds (19) and chronic cough (16) were uncommon sequelæ, and these symptoms might be regarded as the most important from a medical viewpoint. As mentioned previously, post-nasal discharge of mucus (56) or mucopus (34) and nose blocking (46) are the commonest sequelæ, and an explanation of a proportion of these has been made above.

Summing up, one might say that with improved selection of cases and some attention to detail, a totally successful result might be offered in 60% to 70% of cases, and definite improvement in another 30%, but subjects of vasomotor rhinitis must be warned of possible sequelæ.

Details Essential for Success.

Lavage. Details of technique in washing out an antrum I regard as of the greatest importance. I think all patients should be lying at ease on a couch when the trocar is inserted. In this position the nervous patient behaves very much better and is much easier to handle. In a percentage of cases there is a certain amount of shock when the trocar is inserted, and the lying position will prevent a syncopal attack. If a double washout is indicated, I insert both trocars before proceeding to lavage. The patient is sat up for lavage if he feels no effects from the punctures, but if he feels faint the washout is done while he is lying on the side.

The method of insertion of a trocar is also of importance. In my hands, slow increasing pressure is much less disturbing than a sudden puncture by force. If the bony wall does not give on exerting

pressure, a fresh site should be chosen higher up and more posteriorly in the meatus.

In children, the lying position is most important, and the insertion of the anæsthetic swab on a needle may make or mar the relations with the child. It is often necessary to spend five minutes touching the inferior meatus, and then waiting for it to open up before fully inserting the swab.

We can learn points from dentists in the handling of children, and by attention to these minor details one finds that 90% of public hospital patients and 70% to 80% of private patients can have antral lavage performed with local anæsthesia. This is a very important matter, for in the past the objection to repeated general anæsthetics has been an excuse for the performance of antral operations. While on the subject of children, let me state that invariably a child with an antral infection is a poor nose blower. I always attempt to train the child to blow correctly into the dish after lavage, and instruct the parent to make the child repeat the act without a handkerchief at home. The suction action caused by the expiratory blast is a valuable aid to the evacuation of the sinuses. A blocked ostium often calls for great patience, and it is often necessary to manipulate the pressure of the syringe to and fro for ten to fifteen minutes before an ostium will open. Sometimes two trocars will have to be inserted owing to an obstinate blocked ostium, but this does not mean that the condition of the antrum cannot be cured by lavage.

At every subsequent washout, a special effort should be made to find the previous puncture opening; this is much appreciated by the patient.

In the past I have used boracic lotions for lavage, but in view of recent research in America we have definite information to guide us.[2][3][4][5]

Physiological solution of sodium chloride appears to have no effect on ciliated membrane. Tissue immersed in it for several hours shows normal ciliary function. The solution therefore appears to be an ideal lotion for lavage and vehicle for drugs. Tap water, distilled water, hypotonic saline solution, liquid paraffin, argyrol, "Neo-silvol", cocaine solution over 2·5%, adrenalin, eucalyptol, menthol, thymol, zinc sulphate, "Mercurochrome", methiolate, have all been shown to cause slowing or paralysis of ciliary activity. The same applies to zinc ionization. From 0·5% to 3·0% solution of ephedrine in physiological solution is harmless to ciliary activity, and may even cause sustained acceleration. There is no experimental evidence of a subsequent period of fatigue.

I believe that in no case of antral infection should operation be advised until lavage has been exhausted over a period of four to six weeks; while a patient's condition is improving with lavage, surgery should be withheld. During this period the patient's general health improves considerably, so that should operation be advised, he is a much better surgical subject. Exceptions to this rule must occur. In the present state of our knowledge, lavage is useless in multiple polyposis usually due to polypoid pansinusitis, and operation may be advised without delay. The same statement applies to cases of atrophic rhinitis which are definitely secondary to chronic antral infection.

Certain patients will not face washouts, for nervous and psychic reasons, and in these cases one has no option but to make endonasal openings. Geographical considerations also call for similar treatment when a country patient is unable to remain in town for repeated lavage.

Examination of the teeth underlying an infected antrum should never be omitted. One of the patients with latent infection had gross pus evacuated at the first washout, but after removal of abscessed upper molars was completely cured by lavage.

Endonasal Antrostomy.

A minimum of trauma is essential in performing endonasal antrostomy. The advent of the sucker has made this possible, and gauze should be used as little as possible. A deflected septum may often seriously interfere with the operative approach, in which case it should be corrected primarily, for even if the operation is possible without doing this, it will seriously impair the efficiency of the naso-antral opening afterwards.

Instruments should be devised which will not permit fragments of bone to remain in the antrum.

Careful after-supervision is essential, especially in children, and adhesions may need attention.

The indications for endonasal antrostomy are as follow:

1. In children it should be used: (*a*) When lavage has failed and the permanent teeth have not erupted. (*b*) When repeated lavage is impracticable.

2. In adults it should be used: (*a*) When repeated lavage is impracticable for nervous or geographic reasons. (*b*) When it is thought that continuous drainage will effect a cure. (*c*) In elderly people with gross pathological change, when a radical operation is undesirable.

Radical Antrum Operation.

When exposing the canine fossa, the infraorbital nerve calls for care in elevating the periosteum. In my hands, it is less liable to trauma if it is always gently exposed and kept under vision, so that, if necessary, the anterior antral wall can be removed upwards on each side of it.

I cannot agree with those who advocate removal of only apparently diseased portions of the mucous membrane. Once a decision is made that the mucosa is beyond hope of recovery, I believe that every portion of it should be meticulously removed from every corner of the sinus. This opinion has been fortified by the findings on reopening antra when partial removal of mucosa has been done.

The size of the naso-antral opening is of great importance, and many failures are due to a too small aperture. We are performing an operation akin to the radical mastoid operation, in which we expect mucous membrane to grow in and line the denuded antrum. Just as in a mastoid operation

we smooth out every spur likely to retard the healing of the epithelium, so in a radical antrum operation we must make the task of the nasal mucosa as easy as possible. The naso-antral wall must be resected as widely as is compatible with one's fear of hæmorrhage. Personally I prefer a wide opening and place a prophylactic pack in position for twenty-four to forty-eight hours.

As in the endonasal operation, a septum which may impair the efficiency of the opening, must be corrected.

In the past three years I have preferred the extended radical operation, usually known as the Jansen-Horgan operation. This includes enlargement of the normal ostium in the middle meatus and exenteration of diseased ethmoid cells adjacent to the medial antral wall.

Value of Antral Therapy in Frontal Sinusitis.

In my experience, nearly every frontal sinusitis is combined with an antral infection on the same side. Therefore, the first thing to do, when faced with a frontal sinusitis, is to ascertain the condition of the antrum below it. If the antrum is infected, then one possesses the greatest therapeutic aid in healing the frontal sinusitis. Antrum lavage performed even daily, if indicated, usually has a dramatically beneficial effect on the frontal sinusitis, and it is very rarely that the frontal sinus tract has to be touched. I believe that in these cases the frontal sinusitis is an ascending infection from an infected antrum.

Similarly, it is dangerous to perform any radical operation on the frontal sinus in the presence of an antral infection. I believe that this explains many cases of post-operative osteomyelitis in the past.

The Case for Vigorous Conservative Treatment.

Vigorous conservative treatment is, I think, being accepted by most of us. In the past, and even at present, universal adoption has been difficult. We are greatly influenced by habit, and public hospital training influences our private practice.

Treatment by repeated lavage is very difficult to organize at our public hospitals. At our special hospital one room is provided for the purpose, and perhaps ten to twenty washouts may have to be done in one clinic. At a general hospital one nurse has to attend to three rhinologists, and accommodation is poor. All this means that persistent conservative therapy means a great deal of extra wear and tear on the rhinologist, and the line of least resistance is to enter the patient on the waiting list for an operation.

Rhinological textbooks fail to stress the value of persistent conservative treatment. Authors usually dismiss this chapter in a few words, and then devote much space to some operation which they favour, or have labelled with their name. Students and post-graduates obtain their ideas from our special clinics and from textbooks, and thus the possibilities of vigorous conservative treatment have not received recognition.

Conclusions.

1. Vigorous conservatism is advocated in preference to masterly inactivity or radicalism.
2. Gross polypoid sinusitis is the only indication for operation without preliminary conservative treatment.
3. Every infected antrum in which medical treatment has failed should be treated by lavage for one to three months until it is obvious to all concerned that no further progress towards recovery is likely to occur.
4. Hospital clinics should be organized to carry out these principles.
5. Patients subject to asthma, vasomotor rhinitis and psychic disorders should especially be conservatively treated.

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ALLERGY AND ANTRAL INFECTIONS.[1]

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AFTER hearing Dr. Millar's analysis of results, I shall certainly feel rather more cheerful if ever I have the bad luck to develop antral sepsis. I should like to congratulate him on the very compact summary he has given us, and on the really excellent results that he has obtained.

The subject for discussion is antral infections, but I cannot contribute anything useful directly to that subject. I am going to restrict my remarks to antral disease, which is frequently found in allergic subjects and which is quite often confused with infective processes. The situation is complicated by the fact that allergic changes frequently seem to act as a predisposing cause to infections.

When I was asked to join in this discussion I felt that it would be most helpful to try to make an analysis of results of nasal operations in patients suffering from asthma. These operations were mainly radical antrum operations, but I have included a few cases of antrostomy and those in which polypi were removed without any radical procedures. I am afraid that this analysis makes rather sorry reading. It should, of course, be borne in mind that a physician naturally tends to see the failures. When surgery is ideally successful the patient goes back to work and no longer bothers about physicians.

The time available was too brief for making any extensive analysis, but I decided to go through a

[1] Read at a meeting of the Ear, Nose and Throat Section of the Victorian Branch of the British Medical Association on July 20, 1936.

few hundred histories and to pick out all those cases in which the above nasal operations had been performed. No selection whatever was made, except to reject all patients below the age of eighteen years. Effects on the asthma were classified under four headings: very beneficial, slightly beneficial, no benefit, and worse. In this way forty-one cases were classified as follows: very beneficial, 0; slightly beneficial, 3; no benefit, 28; worse, 1.

Clinical Examples.

It would be wearisome to go into details of all the cases, but a few typical histories will serve to emphasize certain points.

Mrs. E.C., aged forty-eight years, complained of recurrent nasal obstruction and headaches. A radical antrum operation and removal of polypi were performed in March, 1932. The patient had asthma for the first time four months later. She had continuous severe asthma, needing large quantities of adrenalin. She died early this year of asthma. Tests revealed sensitiveness to pollens.

Mrs. S.B. had had asthma for five years. She had antrostomy performed in 1932 and a double radical operation in 1933. Her asthma became worse after the operations. Marked sensitiveness to horse dander and pollens was present. She has improved to some extent with desensitization, but she is sensitive to aspirin.

Mrs. E.C., aged sixty years, had asthma for twenty-three years. She had a double radical antrum operation performed seven years ago. She was free of asthma for twelve months. She then became as bad with asthma as she had ever been for the past six years. Tests all gave negative results.

Miss M., aged forty years, complained in January, 1931, of nasal blockage and irritation, with some coughing and wheezing. Tests with pollens gave positive results. About March, 1931, she underwent a double radical antrum operation. Severe asthma developed shortly afterwards and has been almost constant since. Now she often has over 400 minims of adrenalin a day and a third of a grain of morphine two or three times a day. She is hypersensitive to aspirin.

Mrs. W.C., aged forty-five years, had a radical antrum operation performed eighteen months ago. She was free from asthma for twelve months. Frequent attacks have occurred during the past six months.

Mrs. I.A. had had asthma for eight years. She had a double radical operation performed on March 8, 1934. Relief followed for five months. Then she became as bad as ever. Tests all gave negative results.

Discussion.

Certain points should be briefly discussed. It is obvious that there is a risk of bad results in operating in many of these cases, and Dr. Millar has already emphasized this point. It seems that these so-called "allergic" cases are frequently not recognized, and the changes in the mucous membrane are attributed to some sort of infective process. On reviewing many of these histories it is interesting to note that any "extrinsic" allergic factor was apparently not suspected and in many cases obviously not even thought of. It is frequently difficult to distinguish between the two processes, and of course both are present together in a few cases. But in the allergic condition the mucous membrane presents a pale, sloppy, swollen appearance, which contrasts fairly well with the appearances seen when sepsis is present. The secretion is frequently clear and watery, and contains many eosinophile cells. But generally the most important point is the history. Whenever there is any doubt, one should very carefully inquire as to whether there is any variation in the intensity of symptoms with changes of environment or changes of season. Often considerable differences are present. For instance, the pollen-sensitive patient may be perfectly well in the winter and in great discomfort all the summer, especially with "north" winds. Patients sensitive to house dust may be much better away from cities, and especially on sea trips.

The cause of polypoid degeneration of mucous membranes seems to be a mystery, and it would seem well worth while for some energetic pathologist to concentrate his attention on it. Sometimes it is possible to demonstrate some allergic phenomenon which may be the exciting cause, but in more than half the cases the history does not suggest "extrinsic" allergic factors such as pollens or dusts, and allergic tests give negative results. Many individuals who suffer from polyposis come from families where allergy is common.

Alexander Francis has described an interesting triad which should always be looked for. He states that when a patient suffers from polypoid degeneration, operative interference is disastrous if he also happens to be hypersensitive to aspirin and has a low blood pressure. He claims that no therapy will help these individuals, and my general experience goes to confirm this. One might except those patients who give reactions to pollens or to some other allergen. In some of these, desensitization does alleviate matters.

Hypersensitiveness to aspirin is fairly common among asthma patients, and one should always be on the *qui vive* for it. Even one or two grains by mouth will cause violent asthma. Skin tests with aspirin always give negative results. The only way to detect sensitiveness to it is for the patient to swallow it. No apology is necessary for this digression, as aspirin-sensitive patients form a definite group, and those with a large experience have come to realize that they are very difficult to treat. Polypoid changes in the nose are quite common among them, and, as I have said, surgical interference is liable to make things worse.

When the antra are examined by X rays, appearances may be deceptive, and apparently it is not uncommon for allergic changes to be mistaken for the effects of sepsis. Usually the swelling of the mucosal lining of the antra undergoes comparatively rapid changes, and apparently gross changes which appear on one film may have disappeared a few days later. Perhaps these somewhat violent variations in the mucosal thickness give some clue as to the cause of polypi.

When a radical operation has been done in a patient who subsequently is found to be sensitive to pollens *et cetera*, desensitizing treatment is, for some reason, often not very beneficial. One often gets the impression that some sort of reflex from the subsequent scarring keeps the asthma going.

I am afraid that a great deal of the foregoing has been in the nature of destructive criticism. Can I offer anything constructive?

If it can be proved by history and skin tests that the patient is definitely sensitive to some extrinsic factor, a great deal can be done. Obviously he should make strenuous efforts to avoid it thoroughly if possible. If not, desensitization, although tedious, is very effective, that is, in cases of sensitization to a single substance. The more complicated the patient's sensitiveness, the less brilliant are the results. A good deal depends also on having powerful reagents for injection. For instance, house dust sensitiveness is a frequent cause of perennial nasal discomfort, but house dust is so universal and the sterile extracts are so comparatively weak that it is impossible to approach the perfection of results that may be obtained with pollens or horse dander, which are very powerful reagents.

Asthmatics who have polypoid degeneration in the nose and who give no clues indicating some "extrinsic" cause, present a real problem. I must have seen over a hundred of these patients during the last ten years, and I must admit that results from any sort of therapy are generally bad. The aspirin-sensitive patients seem hopeless. In a few, non-specific therapy has apparently helped. Many have had most radical interferences in the nose without benefit. Some of these patients who have never had nasal operations, have been watched and treated carefully for a few years, and then, in spite of the poor outlook, operation has been tried as a last resort. I cannot remember one patient who has benefited for more than a few months. This is a reproach to medicine, and it seems that, at present, knowledge does not exist which can be used to help these patients. I have already mentioned one such patient under my care at present who needs over 400 minims of adrenalin a day in addition to large doses of morphine.

I would sum up by saying that my impression is that great caution should be used in deciding to operate on the nose of any asthmatic patient. Frank infection should be dealt with, but any attempt to remedy surgically the effects of allergy is apt to be very disappointing.

It would also seem that surgeons are sometimes unaware of the great importance of extrinsic factors such as pollens and dusts as a cause of nasal irritation. When there is any suspicion, careful inquiry should be made for any variation in symptoms with season and changes of locality.

Hay Fever.

In seasonal hay fever the outlook is much more satisfactory. As a rule, skin tests show clearly which pollens are responsible for symptoms, and specific desensitization with extracts of a suitable mixture of pollens gives almost complete protection. The method of treatment has changed somewhat during the past few years, and now, instead of giving a short course of injections before each spring, it is found much better to work up steadily to larger and larger doses of pollen extracts until comparatively enormous doses are being given each week. Five or six months of treatment may be required to reach a satisfactory dose. This is then repeated about once every three weeks for another six months, and by then skin sensitiveness may have disappeared and no further treatment is necessary.

Vasomotor Rhinitis or Perennial Hay Fever.

In Victoria, hay fever due to grass pollens usually commences in September and ceases early in January. When the cause of irritation is some factor which is present in the air throughout the year, no clear seasonal variation is noted, but symptoms may be much more intense in some localities than others. Among the more important substances which are known to cause irritation in susceptible persons are horse dander, feathers, cat hair, house dust, kapok, linseed and orris root It is when sensitiveness of this sort is missed that results of surgical interference are so poor. I have seen several cases in which double radical antrum operations have been performed in a futile attempt to relieve the conditions thought to be due to some sort of sepsis. Tests later have revealed sensitiveness to orris root (used in face powder), and symptoms have immediately ceased when orris root has been discontinued. Fairly commonly horse dander sensitiveness is found in these cases when surgical procedures have failed to relieve symptoms, and then it is usually necessary to desensitize the patient in order to produce relief. That enough horse dander is present in the air to annoy these susceptible subjects is surprising, but there is no doubt about the relief obtained by desensitization. It is easy to be wise after the event, but one sometimes feels that subjects of this very pronounced sensitiveness should have been spotted by the surgeon before operation. Unfortunately, in many cases the perennial vasomotor rhinitis is due to hypersensitiveness to house dust and in these results of treatment by desensitization are frequently poor. This seems to be due to the fact that house dust is so universal and the sterile extracts for injection are so comparatively weak. Perhaps when we find out what the active substance in house dust is, we shall be able to prepare more effective therapeutic solutions. When house dust really is the cause of symptoms, it is invariably found that they disappear in certain localities where the dust is less noxious. For instance, many residents of Melbourne become free of symptoms in the finer air of mountains or seaside resorts. Sometimes the best solution is for the patient to move permanently to an environment which suits him. If this is not practicable, efforts must be made to lessen dust, especially in the bedroom, and to desensitize the patient as thoroughly as possible. Desensitization produces relief for nine or twelve months, but in many cases has to be repeated from time to time. One feels that behind these extraordinary cases of hypersensitiveness there is some disorder of metabolism or endocrine function, and that later on, instead of dealing with detailed phenomena of sensitiveness, we may be able to grapple with some more basic cause.

PHYSICAL THERAPY IN ANTRAL INFECTIONS.[1]

By Frank May, B.Sc., M.B., B.S. (Melbourne), D.M.R. & E. (Cambridge),
Honorary Physiotherapist, Saint Vincent's Hospital, Melbourne.

I regard it as an honour and a pleasure to have been asked to contribute to the discussion tonight some remarks on the electrical treatment of antral infections.

Treatment by electrical means represents one of the most important phases of conservative treatment. Several aspects have to be considered. General tonic measures are often of value, and the most important is general ultra-violet irradiation. This has the effect of increasing the patient's resistance to infections, and it helps to prevent the frequency of common colds. This has been proved by many authorities, who give general ultra-violet baths to school children. Once infection is established, the increase of resistance is a help in clearing the infection. Another effect is the increase of calcium in the blood, and I use this method sometimes in the treatment of allergic patients, who sometimes have a lowered blood calcium content.

Local treatment must be studied in acute, subacute and chronic antral infections and in those of the vasomotor type. For the last two years I have been using a technique for the abortion of colds in the head. At first this was so successful that it seemed too good to be true, and so it was. In the first twenty cases it was effective in 100% of cases, but then I had failures, and these were due to the variation in the type of infection. Colds of the influenzal type will not be stopped by any means. Having been a sufferer from frequent colds myself, I have had ample opportunity to experiment. If the resistance of the patient is good and the infection mainly in the nose, one can expect to abort the cold; but if the resistance is lowered, the chances are less.

The technique is to use the water-cooled ultra-violet lamp of the Kromayer type, with a long, thin quartz rod. This is inserted as far as possible into the nose, and exposures of three minutes are given in three to four positions daily or even twice a day. If the cold is in the early, congested, pouring stage, I have known it to be aborted in twelve to twenty-four hours. In all cases there is an almost immediate relief of congestion, and mucus is lessened or stopped. If the infection has gone as far as the throat, failure is usual. Recently I have had better results by combining both ultra-violet radiation and ultra-short wave diathermy. In all cases, whether the infection is aborted or not, a more comfortable time and a more rapid cure are usual.

If an antral or sinus infection occurs, continuing with ultra-short wave diathermy will give relief from much of the discomfort, though whether a more rapid cure results is difficult to say without a large series of cases with controls. I am convinced of its help in all ordinary cases. The longer an infection remains, the more likely are more or less permanent pathological changes to occur.

With antral infections in the acute stage I use the same technique. If an infection is so acute that confinement to bed is required, usually all the natural fighting forces are brought into play, and in using heat these forces are aided, for the effect is that of hyperæmia, and in no way biochemical.

The beneficial effect of diathermy is due to heat mainly; probably the increase of blood supply makes mucus thinner, and, of course, brings in the fighting forces of the serum, though there may also be some other specific bactericidal effects.

Local ultra-violet irradiation produces its result by decongesting and relieving turgescence of the turbinates with improved drainage. Failure in the past may have been due to using diathermy alone. In some cases it may have been due to insufficient treatment or a blocked ostium.

Seldom do I find acute infection made worse by ultra-short-wave diathermy. One patient had an increase of pain, and treatment was unsuccessful. In the very acute stages, when the patient is confined to bed, I give infra-red luminous or radiant heat irradiation to the antra. This has a very soothing effect, and prepares the way for diathermy a few days later. There is no contraindication to treatment of this nature in combination with antral lavage.

In acute frontal sinusitis, when there is much pain, I would prefer to use infra-red irradiation rather than diathermy, and it is always wise to treat the antra as well.

In subacute sinusitis and antral infections diathermy is the treatment of greatest value. As a rule, the response is rapid. If there is any allergy or congestion of the mucosa, I give ultra-violet irradiation locally. Just when an infection becomes chronic is difficult to judge.

A child, aged nine and a half years, had a severe acute pansinusitis with a profuse purulent nasal discharge; she was three weeks in bed with mild fever. On commencing treatment a skiagram was taken.[1] Ultra-short-wave diathermy was given frequently, and a skiagram was taken as a check at weekly intervals. The X ray examination at first revealed gross bilateral antral dulness, but each subsequent examination showed improvement. After two weeks' treatment and two weeks' holiday at the seaside (in winter), a skiagram was taken which showed normal antra. Since then the patient's colds have not been so frequent, they clear more quickly, and the child, now ten and a half years of age, is robust and well. No lavage was used in this case.

The second patient was a girl, aged fourteen years, who had severe infection over the last half year. Two positive washouts did not improve the condition greatly. I was asked to give treatment in an attempt to avoid an operation. The nose was very congested and obstructed, six handkerchiefs being used per day. X ray examination revealed gross bilateral dulness. With treatment by local

[1] Read at a meeting of the Ear, Nose and Throat Section of the Victorian Branch of the British Medical Association on July 20, 1936.

[1] Dr. May illustrated his case reports with skiagrams reproduced on the screen.

ultra-violet irradiation and ultra-short-wave diathermy three days a week, the condition improved quickly; at the end of four weeks an X ray examination showed a remarkable difference.

The length of history in this case would suggest that the condition was fairly chronic and would not respond, but a ray of hope was given by the fact that for four weeks at the early part of the year symptoms were much less until another cold was contracted.

A woman was referred to me complaining of pain over the left antrum. A skiagram, taken some months ago, showed some antral dulness of the left side. One antral washout gave some relief. Previous films over two years had revealed no abnormality. Treatment with ultra-short-wave diathermy at first caused intense pain during treatment, the pain subsiding in about a quarter of an hour; it also caused some tenderness of the malar region, which lasted about twenty-four hours. No reaction was noticed except after the first three or four treatments. The patient has now been under treatment for three to four weeks and is free of all pain. A skiagram taken a few days ago shows that the condition is now practically normal, and the symptoms have quite disappeared.

What the subsequent history of these patients will be is difficult to say.

In the more chronic cases that I have been asked to treat, I have not been able to give any very definite help. The cases have been long standing and the patients have had bilateral double radical operations. The most disappointing cases are those with chronic ethmoid and sphenoidal infection. It is difficult to give adequate treatment in these circumstances. I have tried ultra-violet irradiation locally, ultra-short wave diathermy and nasal ionization, but have obtained no very great benefit, except in those patients whose symptoms were in some degree due to allergy. Zinc ionization may help to clear an antrum after intranasal antrostomy. One patient with chronic sinusitis has as a result of treatment obtained freedom from frequent colds for the last two years.

I have had many other cases which have been successful, but no opportunity for control skiagrams was possible.

Ultra-short-wave diathermy is a greatly improved method, for there are a better depth heat and a possible specific action on the infecting agent. I feel sure that we have in ultra-short-wave diathermy a method which will aid resolution, in many cases making the infection of much shorter duration, probably clearing many infections which would not otherwise improve. This is of importance, for possibly the number of antral operations would be reduced.

Now for the allergic side. Treatment by general ultra-violet irradiation causes an increase in the blood calcium. Local ultra-violet irradiation in some way desensitizes the mucosa, and I do not think that it causes any histopathological change. There has been no work done on this as far as I know. Original work has recently been done in America on ionization with zinc, and I need not touch on this more than to say that there is a reaction in the mucosal and submucosal tissues. The early reaction (if severe enough) is that of destruction or capillary reaction with lymphoid response which may go on to fibrosis. No effect on mucous glands is observed, but in all cases an absence of cilia is reported. Ionization is always followed by some histopathological change. Whether this is going to be for good or bad later on, cannot be said, but it must be remembered that for years treatment by the cautery, by chemical or by other means, has been used. There is no proof that ionization is a harmful procedure, and while the subject is still controversial, the clinical benefit obtained justifies us in using it cautiously. Those patients benefited most are adults; the young and the old do not do so well. I use ionization only for vasomotor conditions, though it has been used in infections of the antrum and sinuses when it is possible to insert a trocar easily into an artificial ostium.

I am not in a position to be very definite about results yet, but in hay fever and pure vasomotor rhinitis results are encouraging. Recently the daily papers reported the use of this treatment at Saint George's Hospital, London. If these conditions can be relieved by treatment, it may help to decrease the incidence of antral infections, and help the final clearing of an infection because of improved drainage.

Another aspect of sinus infections is that of chronic cough. This can be improved if not relieved entirely by diathermy. The result may be due to the effect of heat on the circulation of the bronchial tree, or to an antispasmodic action on the nervous mechanism. I have seen patients improve in spite of chronic nasal infection. If the nasal condition can be cured, more permanent results can be expected.

In conclusion, it must be realized that physical therapy offers a very definite method of treatment which has proved its value in antral infections. It is a most valuable form of conservative treatment, and without its inclusion the term vigorous conservative treatment cannot be adopted. I have not seen any patient made worse by physical means.

All hospitals are equipped with departments of physical therapy, and rhinologists should make more use of them, should know the methods, and order just what they desire. It is only by these means that a true evaluation of this form of therapy can be obtained. With the enormous amount of clinical material in out-patient departments at our public hospitals, a very short time would be necessary to give physical treatment a trial.

If you glance through the records of physical therapy departments, you will see that many more patients in the early stages are being referred to them now instead of all the hopeless derelicts that used to fill the clinics. It is still noticed that among the patients sent those with infections of the antrum are seldom included. Surely if conservative treatment is decided upon, either because of opinion or because of a waiting list, this time would be well spent in a department of physical therapy.

Reports of Cases.

CARBON MONOXIDE POISONING WHILST DIVING.

By J. R. Nimmo, M.B., Ch.M.,
Thursday Island.

The breathing of air charged with exhaust gases from an internal combustion engine and consequent carbon monoxide poisoning are common occurrences on land. Recently the death of a diver whilst working below demonstrated the fact that it is possible for a diver to be killed by carbon monoxide. There is reason to believe that no previous case of this nature has been reported.

Methods of Diving.

There are two methods of diving. In the first the diver swims down to depths up to twelve fathoms and brings the shell or *bêche-de-mer* to the surface. No apparatus is employed, excepting a pair of swimming glasses.

The second method is used in diving for pearl shell in depths up to forty-five fathoms. Divers use full dress and helmet, or helmet and corselet only. The latter method is rapidly gaining favour, as it allows of greater mobility, both in descending and in working on the bottom, and insures a better air supply. The helmet acts as a diving bell on a small scale. The compressed air for the diver is stored in a large metal cylinder, and during diving operations the pressure is maintained by means of a compressor driven by an internal combustion engine. Prior to the accident referred to below, the air intake was fixed to the compressor, with its opening near the floor-boards. Consequently any gases escaping from a leaky engine or exhaust would be drawn into the compressor and delivered to a diver working on the bottom. Latterly, all intake pipes have been brought outside the engine-room housing.

History of Accident.

At about 10 a.m. on December 6, 1935, I.M. was working in nineteen fathoms. After half an hour he was brought to ten fathoms, and after staging for ten minutes to six fathoms. He then made the signal for more air, although four times his requirements was being delivered to him. As he did not answer the next signal of the tender, the second diver, B., went down and found that I.M. was apparently dead. He was brought to the surface and made fast in his corselet, and then sent down again in the hope that he might recover. He was thought to be suffering from diver's paralysis. B. went down also, but he could not remain below, as he felt very ill. He said afterwards that his head began to ache and he began to lose control of his limbs. He was dragged on board and fell unconscious, frothing at the mouth. He lay on the deck for half an hour and then was transferred to another lugger, tied into a corselet and lowered to the bottom. He regained consciousness in another hour, was gradually brought to the surface, and was surprised to find himself on a strange boat. I.M. showed no signs of recovery, so was placed on board and the lugger made for Thursday Island under sail and engine. The vessel arrived in port at 8 a.m. the next day. On the way in, one of the crew, Sammy, a half-caste aboriginal, was found lying dead in the fore-cabin. Another boy had also been below, but he developed a headache and felt ill, so went on deck. He thought that Sammy was in a deep sleep when he left him. All of these four men were victims of carbon monoxide poisoning.

Examination of the lugger disclosed the fact that there was a leak in the exhaust pipe and fumes were passing from the engine room to the fore-cabin by a port in the bulkhead. There was a pressure of 150 pounds remaining in the air cylinder.

Experiment.

A healthy guinea-pig was placed inside a helmet and air was turned on. After fifteen minutes the guinea-pig became drowsy and unsteady on its legs. The engine was then started up and coupled to the compressor. Five minutes later the guinea-pig collapsed, unconscious. On being placed in the fresh air, it revived in fifteen minutes. Although the guinea-pig was breathing the same air as the diver, there was no increase of atmospheric pressure in the helmet as compared with slightly more than three atmospheres in the case of a diver working at eighteen fathoms.

The late Professor J. S. Haldane, in his epoch-making report on deep water diving for the Lords Commissioners of the Admiralty, pointed out that the effect on the human body of carbon dioxide is multiplied by the absolute pressure. For example, at 33 feet (two atmospheres) 1% carbon dioxide has the same effect as 2% on the surface. Presumably the same would hold good of carbon monoxide. A trace of carbon monoxide at normal pressure would become a lethal dose as the pressure increased.

Post Mortem Examinations.

A *post mortem* examination of Sammy was carried out. He was a young man of good physique, all organs being normal in appearance. A pinkish mucoid froth was exuding from the nose and mouth. Both lungs were œdematous. Arterial blood was light in colour and the blood generally was of low viscosity.

The same signs were noticed in the examination of I.M. In addition, there was an area of degeneration one inch in diameter in the wall of the right ventricle. The heart was enlarged and dilated. This condition was possibly due to the effects of previous non-lethal doses of carbon monoxide. On opening the thorax or cutting into any solid organ, nitrogen bubbles were noticed to be escaping from the blood. Spectroscopic examination of the blood was not carried out.

Comment.

The true significance of the presence of nitrogen bubbles when death has occurred while a person is diving is difficult to assess. The cessation of respiration and circulation bottles up nitrogen under pressure in the tissues, and it is only when the tissues are incised that bubbles escape, even after twenty-four hours. If Haldane's fundamental axiom is borne in mind, that caisson disease is due solely to too rapid decompression, then it must be obvious that death occurring before a diver ascends must be due to some other cause. It is generally accepted that sudden death in caisson disease is due to an excessive amount of expanding nitrogen being received into the right heart. At autopsy in such cases multiple small hæmorrhages will be found in the central nervous system and in other tissues of the body. These hæmorrhages are due to the bursting of thin-walled terminal vessels. In the body of a diver who has died below (such as that of I.M.) these hæmorrhages are not present. The presence of small air emboli can be tolerated by a healthy individual. A recent report of a self-experiment by a German investigator, who injected increasing amounts of air, up to 10 cubic centimetres, into a vein without any untoward result, helps to prove that the circulation is capable of absorbing a certain amount of air; how much is problematical. It is certain, however, that the quantity is considerable, as local divers are notoriously careless about decompression, yet cases of paralysis and deaths from compressed air are surprisingly rare. In the case of I.M. there could be no question of caisson disease.

Haldane has laid down that air pressure can at least be halved in one "stage". In fact, a diver can come from 18 fathoms (48 pounds) to 5 fathoms (15 pounds) with safety. (The figures for pressure are additional to atmospheric pressure.) Paralysis is unknown in depths of less than ten fathoms.

In the examination of I.M. the possibility of death from drowning had to be borne in mind. Working in a corselet, it is possible for a diver to slip out of the helmet and be drowned. The water-logged appearance

of the lungs and the blood-stained froth at the mouth were both suggestive. The froth was more mucoid than is usually the case in drowning. Furthermore, there was no water in the stomach. The inhalation of a small amount of water by a person breathing compressed air is usually fatal. The water in the lungs acts as a barrier to the escape of excess nitrogen and helps to initiate caisson disease.

In conclusion, it is interesting to note that the realization of what should have been regarded as an obvious possibility has shed light on several previously perplexing happenings. In my own experience I had been puzzled as to why divers working at moderate depths had signalled for more air when they were receiving three times their requirement. In two instances divers had then left their helmet to come to the surface, with fatal results. In both instances the cause of death was given as drowning and diver's paralysis, whereas the fundamental cause had been carbon monoxide poisoning. The inhalation of water had added the signs of drowning to those of carbon monoxide poisoning, and it is possible that the case of I.M. would have been interpreted incorrectly but for the unenviable experience of the second diver and Sammy.

Since the installation of an outside air intake local divers are unanimous in declaring that they feel much better than formerly. They attribute this to the fact that they can no longer smell the engine fumes in their air supply. There is no doubt that they had been inhaling small amounts of carbon monoxide and took their headaches and tiredness to be part of the day's work.

One of the few instances of a diver's having an outside pipe installed prior to this year was that of a man who could not bear the smell of onions cooking while he was on the sea bed. He was really the pioneer of what has now become an established rule.

ALTERNATING PERNICIOUS ANÆMIA AND POLYCYTHÆMIA.

By G. A. Birnie, M.C., M.D. (Melbourne), D.P.H. (London),

Honorary Physician to Out-Patients, Alfred Hospital, Melbourne; Visiting Physician, Caulfield Repatriation Hospital, Victoria.

On January 10, 1935, A.G., a male, aged sixty-seven years, attended as an out-patient at the Alfred Hospital, complaining of increasing weakness, shortness of breath on slight exertion, loss of appetite, a sore tongue, tingling and numbness in both legs and difficulty in walking.

He stated that four years previously he had consulted Dr. S. V. Sewell, who informed him that he was suffering from pernicious anæmia and had ordered liver treatment. Since that time he had not been under any medical care, but had taken cooked liver intermittently.

He was very pale and weak, and investigation in hospital showed that the erythrocytes numbered 1,760,000 per cubic millimetre. Macrocytosis and a large excess of lymphocytes were noted. A test meal disclosed complete achlorhydria, the spleen was palpable, there was evidence of some increased rigidity, and the deep reflexes were increased. On liver therapy ("Campolon") there was rapid improvement, and on the patient's discharge on February 9, 1935, the red cell count was 3,260,000 per cubic millimetre and the subjective phenomena had largely disappeared.

He returned to his home in the country with instructions to continue taking cooked liver daily. On August 9, 1935, he was again admitted to hospital. He stated that until a month previously he had felt perfectly well. Since then he had felt increasing weakness and breathlessness and was losing weight. His appearance was in striking contrast with that presented seven months previously; he had a high colour and his mucous membranes showed a deep red tint.

A blood count showed the erythrocytes to number 11,000,000 per cubic millimetre, the hæmoglobin value was 150%, and the colour index was 0·65. The systolic blood pressure was 150 and the diastolic pressure 95 millimetres of mercury. A test meal revealed complete achlorhydria; the Wassermann test gave no reaction. The patient was given phenylhydrazine hydrochloride, 0·03 gramme (half a grain) twice daily. Rapid improvement followed, as shown by the blood count. On August 20, 1935, the erythrocytes numbered 8,500,000 per cubic millimetre. On August 29, 1935, they numbered 7,600,000, and on October 24, 1935, they numbered 8,000,000. Altogether the patient had 0·6 gramme (ten grains) of phenylhydrazine hydrochloride.

He then returned to his home in the country, but on January 6, 1936, again reported to the hospital. He was looking very pale and ill, complaining of great weakness and exhaustion, and of breathlessness on the slightest exertion. He had had no phenylhydrazine hydrochloride since leaving hospital. His erythrocyte count was 2,800,000 per cubic millimetre. The average diameter of the red cells was 8μ. Anisocytosis and poikilocytosis were present. With liver extract ("Campolon") rapid improvement resulted. A count on March 9, 1936, showed that the leucocytes numbered 7,000 and the erythrocytes 5,800,000 per cubic millimetre. The hæmoglobin value was 75% and the colour index was 0·5. The average diameter of the red cells was 7·48μ.

The patient then returned to his home with instructions to continue taking liver by the mouth, and on May 21 his count was: leucocytes 10,000 and erythrocytes 5,600,000 per cubic millimetre; the hæmoglobin value was 95%, the colour index was 0·9, and the average diameter of the red cells was 7·8μ. The red cells showed anisocytosis and poikilocytosis, polychromasia and many macrocytes. The leucocytes were normal.

The explanation of the changes in the blood picture of this patient is not clear. In cases of polycythæmia treated with phenylhydrazine hydrochloride the supervention of an anæmia of the pernicious type is not unknown following excessive dosage. This could not apply in the present case. The literature apparently gives no instance of an over-production of the active principle as a result of liver administration, though this has been shown to be in excess in polycythæmia.

Reviews.

EMERGENCIES OF GENERAL PRACTICE.

In the preface to "Manual of Emergencies" the author, J. Snowman, states that the work was based originally on Lenzmann's treatise, but that in this, the third edition, the whole subject matter has been revised so as to present a *résumé* of the modern teaching of British authorities on pathology, diagnosis and treatment of emergencies of general practice.[1]

After a few opening pages in which the pathology and treatment of shock are usefully discussed, the book enters on its essential classification into the dangerous emergencies of respiratory, cardiac, nervous, gastro-intestinal and urinary systems. A section on poisons follows, and the closing chapters are given over to a consideration of the dangerous emergencies of midwifery.

Here is a book with few disappointments for the general practitioner. A capacious breast pocket will hold its 380 pages, and armed with these he will seldom be at a loss in dealing effectively with the sudden, diverse and

[1] "Manual of Emergencies, Medical, Surgical and Obstetric: Their Pathology, Diagnosis and Treatment", by J. Snowman, M.D., M.R.C.P.; Third Edition; 1936. London: John Bale, Sons and Danielsson, Limited. Crown 8vo, pp. 410. Price: 10s. 6d. net.

sometimes amazing emergencies of practice which are his daily portion. Nor is this book, small though it is, merely a matter of unilluminating headlines. Rather does it seek to prepare the practitioner for the principles of treatment by short but well-written essays on the pathology underlying the emergencies to be treated. Symptoms, physical signs and prognosis are given their places, and where minor surgical procedures are indicated the details are full and explicit.

Generally speaking, the subject matter of the various systems is well tabulated and is clearly discussed in a most readable fashion. The section on emergencies of the gastro-intestinal systems suffers from the vastness of the subject and the smallness of the space that can be allotted to it. Ten pages are given to the general discussion of intestinal obstruction, and in this small compass there must needs be the omission of some interesting feature of the lesion. We miss particularly the important differentiation between high and low blockage of the small bowel and between obstruction of the small and large intestine. Perhaps insufficient stress is laid on the importance of loss of electrolytes from the blood in the copious vomiting of the digestive juices. The very valuable method of duodenal drainage as elaborated by Wangensteen does not receive mention. The lethal effects of distension, or rather of the sudden decompression following the operative opening of the bowel, are not considered. In the treatment of paralytic ileus bowel stimulants are given pride of place, and sedative treatment, generally considered much more effective, is not discussed. No indication is given of the diagnostic and therapeutic value of spinal anæsthesia.

The section of poisons follows classical lines. There is little scope for imaginative writing here, but we wonder why all treatises omit discussion of two of the commonest forms of accidental poisoning in general practice, namely, kerosene poisoning and eucalyptus poisoning.

The chapters on the emergencies of midwifery maintain the standard of the preceding pages.

We miss reference to dangerous emergencies of the bony system. Acute osteomyelitis has an importance at least equal to that of acute gastro-enteritis.

In spite of these omissions the book will be a most valuable help to the practitioner in times of emergency.

APPENDICECTOMY.

Dr. W. J. Stewart McKay, known in the literary world as the author of "Lawson Tait: His Life and Work", has published a book entitled "Appendicitis: When and How to operate: A Guide for the General Practitioner".[1] The author was for many years senior surgeon at Lewisham Hospital, Sydney, where he gained the esteem and confidence of his colleagues and of more than a generation of house surgeons. During the last two years, as he tells us in his preface, he has been resting at Lismore, on the north coast of New South Wales, and he has written a guide "for the general practitioner in the country who thinks that he would like to try and remove a diseased appendix"—a phrase not very happily chosen.

The author has gone to an immense amount of trouble and has included a great deal of detailed direction on every aspect of the subject. He seems to think that the country practitioner is an uninstructed person who does many things incorrectly. "Usually the medical attendant seeks McBurney's point by jabbing the patient vaguely, and often with a cold finger, somewhere in the right iliac region." Our impression is that most country practitioners are capable and careful and do not merit remarks of this kind. Unfortunately we must point out that throughout the book the author adopts what must be described as a hypercritical and almost an unfriendly tone about his brother practitioners in the country.

The book is carefully planned. After a chapter on the anatomy and structure of the appendix, the author includes a chapter on the historical aspect of the subject. He then discusses in turn the clinical history, symptoms, signs and their demonstration; diagnosis and differential diagnosis; preliminary and preparatory treatment; the country operating theatre; the surgeon's instruments and ligatures; the operation; the after-treatment; cases of acute appendicitis; purulent appendicitis; appendicitis with abscess; operation for gangrenous appendix; pseudo-ileus; ileus; and occasional post-operative complications.

We may state at once that there is a great deal in this book that is valuable; but if a book is to be regarded as a guide for the tiro, it must be sound and indeed unassailable on matters of basal importance. This book fails on at least three counts. In the first place, we do not approve of the advice to the young operator, or to any operator for that matter, to use Battle's incision as a routine. After its use, especially by the inexperienced, unpleasant intra-abdominal sequelæ are much more likely to occur than when other incisions are employed. Moreover, an abdominal wall that has been subjected to a Battle's incision is not nearly so strong as one in which the grid-iron incision has been used. In the second place, the author is not nearly definite enough about the sterilization of catgut. He advises the practitioner to buy "sterile interior" catgut and to proceed with its sterilization. He states that a modification of the method suggested by Bullock and others is reliable, but he also recommends Lockwood's method. Further on he writes: "It has been maintained that spirituous biniodide of mercury is ineffective as a sterilizing agent; but as I have used gut prepared in this way for thirty-five years, I am content with it." If the practitioner starts with "sterile interior" catgut the biniodide method may be sufficient; it may not. In any case, the words quoted are likely to be taken out of their context and, as the author is referring to what he did before "sterile interior" catgut was available, they are, in our opinion, misleading. Like many who have used the biniodide method, the author has been fortunate. Others have not been so fortunate. The biniodide method of sterilizing catgut, if it is to be mentioned in such a book as this, should be mentioned merely to be condemned. In the third place, in discussing the treatment of appendicitis with abscess, the author writes: "Thus, after getting rid of as much pus as possible, the abscess cavity is filled with iodoform gauze that has been lightly washed in sterile water. A drainage tube may also be introduced, and some surgeons split the tube from end to end and bring the gauze out through it." Vaseline gauze may be used in certain circumstances, but gauze used in the way the author describes will never drain pus. It will make a most effective plug, and the author leaves it *in situ* for four days.

From the foregoing we must conclude with regret that this book cannot be recommended as a guide for the general practitioner.

ANTE-NATAL AND POST-NATAL CARE.

It is generally recognized that ante-natal care is one of the most important advances made in the realm of obstetric work in recent years. In spite, however, of its adoption, maternal mortality has not been diminished, and so in some quarters it is the fashion to decry it and to say that it has failed in its purposes. F. J. Browne, in his book "Antenatal and Postnatal Care", combats this view and maintains that if ante-natal care has failed, it is not because it is inherently useless, but because it has been comparatively seldom given a chance by being properly practised.[1]

In his book he epitomizes the teaching given in a large modern clinic. We think that this book should be in the hands of all who practise obstetrics, and particularly of

[1] "Appendicitis: When and How to Operate: A Guide for the General Practitioner", by W. J. S. McKay, M.B., M.Ch., B.Sc.; 1936. Australia: Angus and Robertson Limited. Demy 8vo, pp. 270, with illustrations. Price: 12s. 6d. net.

[1] "Antenatal and Postnatal Care", by F. J. Browne, M.D., D.Sc., F.R.C.S., F.C.O.G.; 1935. London: J. and A. Churchill. Demy 8vo, pp. 495, with 58 illustrations. Price: 15s. net.

those who are interested in the work of an ante-natal clinic. The subject is dealt with fully, concisely and clearly. The history and development of ante-natal care are briefly described in the opening chapter. The clinic room and its equipment, the examination of the patient, and the methods of diagnosis are next discussed. It is pleasing to note that in dealing with palpation some of the methods introduced by Professor J. C. Windeyer and taught at the University of Sydney are described and illustrated.

There is a very interesting and instructive chapter on the influence of the emotions upon pregnancy and parturition. Maturity and post-maturity and the methods of diagnosing these conditions are well described. All the usual complications which may occur, such as abnormal presentations and positions, hæmorrhage in the early and later months, hydramnios *et cetera*, are considered. The chapter on *ante partum* hæmorrhage and its diagnosis and management contains very sound advice and is very well written. The discussion of contracted pelvis and disproportion is very good, the advice given is eminently sensible and the dangers of meddlesome interference are fully stressed. The diseases and disorders which may be met with in the digestive tract and in the circulatory, respiratory, nervous and renal systems are fully described. The dangers following preeclamptic toxæmia and eclampsia are discussed, and the whole chapter is one which contains very valuable information for all obstetricians who wish to reduce the number of deaths from toxæmia, which play such a large part in maternal mortality. The author is to be congratulated on the production of this book, and we can strongly recommend it to all who practise obstetrics, whether teacher, consultant or general practitioner, for it contains all that is essential for the proper management of ante-natal care.

DISEASES OF THE EYE.

THE same difficulty confronts us when attempting to review the eighth edition of Sir John Herbert Parsons's "Diseases of the Eye" as arose when reviewing the previous edition.[1] That difficulty is impartiality. To have worked intimately with Sir John Parsons over a number of years leaves one somewhat hypnotized by his breadth of view and scholastic attainments. One has only to turn to his "Pathology of the Eye", in four volumes, or his books on perception and colour vision to apprehend the vastness of his knowledge. Although his "Pathology of the Eye" is now nearly thirty years old, it is still without parallel in the ophthalmological world, and is likely to remain so for some considerable time. Then again, what important committee of inquiry on some visual or optical problem can be found on which Sir John Parsons has not sat or before which he has not given expert evidence. Since the deaths of Fuchs of Vienna, Treacher Collins of London, and Wilmer of Baltimore, he has at an early age become the "grand old man" of international ophthalmology, and it is our fervent wish that his erudite mind may long be spared to embellish the art that he practises.

The eighth edition of this book, now under review, contains only a few additions; the chief amongst these is the apparent importance of histamine and acetylcholine in ophthalmology. In the light of modern knowledge of these two drugs, the action of mydriatics and miotics is satisfactorily explained. When used therapeutically histamine (aminoglaucosan) has not proved very successful in relieving acute glaucoma, but this is somewhat to be expected, in view of the fact that recent experiments point to the possibility of the aqueous in acute glaucoma containing an excess of histamine. On the other hand, subconjunctival injections of eight minims of acetylcholine in cases of embolism of the central artery cause dilatation of both arteries and veins in the retina and dislodgement of the embolism. This is admittedly a great advance in one branch of eye work.

With regard to the orthoptic treatment of squint, we feel obliged to quote a short paragraph from the text (page 558): "It [orthoptic treatment] has one overwhelming argument in its favour, *viz.*, that when successful it cures the squint. The cure is complete, *i.e.*, the patient is placed in the same condition as a normal person; his eyes are straight, and he has binocular vision. No other treatment can be said to cure the disorder. The eyes can be put straight, but this cures only the deviation; the other elements of the disorder remain unaffected." There is no doubt that orthoptic cure is the ideal method, but undoubtedly a much greater understanding of binocular vision is required before the classical operation of advancement and recession can be entirely abandoned.

In regard to the operative treatment of retinal detachment, the author appears to be still somewhat sceptical, but we feel here that we must draw swords with him. While permanent cure cannot be guaranteed in every case, the percentages of operative successes are rising yearly. Cole Marshall's monograph on detachment of the retina shows that stupendous advances in technique are being made every year and that from the Larsson Clinic in Stockholm up to 90% of cures have been reported.

In this age of monographs of specializations within specialties, it is most refreshing to read a comprehensive review of ophthalmology by so mature and sagacious an author, and we trust that he may continue to give us fresh editions whenever advances in ophthalmology warrant it. In this way his text-book is assured of ready and continuous sale.

[1] "Diseases of the Eye", by J. H. Parsons, C.B.E., D.Sc., F.R.C.S., F.R.S.; Eighth Edition; 1936. London: J. and A. Churchill Limited. Demy 8vo, pp. 713, with illustrations. Price: 18s. net.

A SYNOPSIS OF PHYSIOLOGY.

SINCE the publication of the first edition of their "Synopsis of Physiology" the senior authors, Dr. A. R. Short and Dr. C. I. Ham have retired from active teaching. In the preparation of the second edition of this work they have had the collaboration of Dr. C. L. G. Pratt.[1]

The "Synopsis" series of text-books on medical subjects is well known to students. Though there is a persistent demand for books of this kind, their use is not to be recommended to the student. Danger lies in the temptation to neglect the more discursive treatment of the subject. The student may come to regard physiology as a group of facts concerning the activities of the body rather than to think of the body as an organism in which the harmonious coordination of many functions is the essential feature.

Considerations of this kind do not apply to the more experienced reader. As an *aide mémoire* to the teacher or to the graduate with a good working knowledge of the subject this little book will be very useful. To such readers, too, the fact that some of the statements have been compressed until they are almost cryptic will be of little consequence.

It is generally possible to find mistakes in a text-book. In their context these may be of no importance, but when they appear as bald statements they are more serious. For example, statements that the neutral chloride of the gastric contents is the difference between hydrochloric acid and total chloride, or that the basal metabolism is the minimal metabolism or metabolism during sleep, would have been impossible in fuller discussions of the subjects.

Such criticisms might be made of any book of this type. The authors have on the whole been very successful in the extremely difficult task which they have set themselves. They are to be congratulated on the thoroughness with which the first edition of their book has been revised. They do not appear to have missed any of the outstanding advances in physiological knowledge which have been made during the last seven years.

[1] "A Synopsis of Physiology", by A. R. Short, B.Sc., M.D., F.R.C.S., and C. I. Ham, M.B., B.Ch., F.R.C.S.E.; Second Edition, edited by C. L. G. Pratt, M.Sc., M.D.; 1936. Bristol: John Wright and Sons Limited. Crown 8vo, pp. 312, with illustrations. Price: 10s. 6d. net.

The Medical Journal of Australia

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All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

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THE GENERAL PRACTITIONER AND HIS READING.

Non-medical people would agree with the statement that a medical practitioner should make some attempt to keep abreast of the constant advance in medicine, and the medical practitioner himself knows that it is true. However much the public may be attracted by a medical attendant's charm of manner or social graces, it expects him to know his job. The medical attendant has constantly before his mind the impossibility of acquiring an intimate knowledge of all the discoveries that may throw light on the cause of disease; he tries, sometimes in vain, to master the details of new diagnostic tests, and he stands aghast before the array of new therapeutic agents that are brought to his sometimes unwilling notice. Possibly he feels like Olive Shreiner's enthusiast who climbed the mountain in search of truth to find that the higher he climbed, the higher the mountain became. Actually he is not in so bad a case. No man can know intimately the whole of medicine, though a few may have the ability to take a comprehensive and at the same time a fairly detailed view of the many subjects comprised in it. There are those who would say that a general practitioner should study the whole of medicine and that specialists should devote themselves to one of its subdivisions. Both, of course, need to have some knowledge of medicine as a whole; and both can acquire sufficient for their needs. We can dismiss the specialist who is outside the scope of this discussion with the by no means original observation that if he chooses to wear blinkers, he will often do much harm to his patient and bring discredit on his calling. The general practitioner has to deal, at least in their early stages, with disorders of every part of the body. Naturally, occasion will often arise when, having traced a pathological condition to one of the narrow subdivisions of medicine, he finds himself unfamiliar with its minutiæ and has to seek the advice and help of one who has devoted himself to its study. The point at which he must seek help will depend ultimately, not on his years of experience, not on his clinical intuition, not on his audacity or his lack of it, but on the depth and extent of his reading. If his reading has been superficial he may be sure in his own conceit and rest content with symptomatic or empirical methods of treatment.

To be effective, medical reading should be regular and systematic. This is not always easy. The general practitioner has an exacting life and, apart from his work, many demands are made on him. However, if he wishes to read, he will find the time to devote to it. He may read from text-books or from journals. From time to time handbooks on various subjects are recommended to practitioners in the review columns of this journal; they will give useful outlines of their subjects as a whole. New work can best be followed in such books as the "Medical Annual" and the volumes of the "Recent Advances" series, published by J. and A. Churchill, London. Larger books will be sought when a more detailed study of a subject is to be made. Medical journals, however, will provide the practitioner with most of the information that he needs. Members of

the British Medical Association in Australia receive both The Medical Journal of Australia and *The British Medical Journal*. In the pages of these journals most of the newer aspects of medical science are discussed and abstracts from journals of other countries are published. Both journals also publish articles which enable the practitioner to revise his knowledge and adjust his outlook. In this journal special articles on important subjects have recently been published, and the series will be continued as opportunity arises. Unfortunately, reading from one or two medical journals can rarely be systematic, and this has been held as a reproach to those issuing the journals. Those who make this complaint should remember that editors have to deal with material that is offered and that contributors have divergent interests. Ideally, the several Branch Councils in Australia should consult with one another at the commencement of each year so that no serious overlapping in the subjects for the year would take place. This, however, is perhaps a side-issue to the present question. In urging medical practitioners, particularly in country districts, to look to their journals for their reading matter, we would suggest that each practitioner should subscribe to at least one extra journal. He would then be in a position to help his neighbour as well as himself, and he might initiate a seminar or study circle for the exchange and discussion of journals.

From time to time the statement is made that the day of the general practitioner is done, that so much is being filched from him by the major and the minor specialist on the one hand and by the governmental octopus on the other that little will remain or even now remains for him. It will be a sorry day for medicine and for the public if this should ever happen. This is not the occasion to discuss the future of the general practitioner, fascinating though the subject may be. There will always be need for the man who takes the whole of medicine for his province, and he will always be the most honoured and honourable of its servants. The general practitioner can best preserve his status by remaining a student all his days.

Current Comment.

THE FEMALE BREAST.

It is strange, says Dr. Claoué,[1] that through the ages painters and sculptors have depicted the human male as a muscular being with lean flanks and a chest free of fat. Women, on the other hand, have been presented in a variety of forms, sometimes fat, sometimes thin, but all suggesting in the main that woman is an animal who stores up energy with an eye to pregnancy and nursing. Since the distant day when mankind first gave evidence of an artistic sense, magical and religious symbolism has always had an important place in graphic art, and the imagery of epochs long past depicts the female breast as a bulky, pendulous, drooping thing. What could this have been but a graven image of fecundity, of an organ which helped to replenish the earth? At Brassempouy (Landes) and at Lespugne (Haute-Garonne) statuettes carved from mammoth tusks of the Aurignacian period have been unearthed: slender figures with microcephalic heads and huge genital organs. The breasts are long, bulky cylinders reposing upon an enormous abdomen flanked by huge hips. And at Mentone the statuettes unearthed in the Grimaldi grottoes, all sculptured from steatite, are steatopygous. They show an immense development of the adipose tissue of the buttocks. Some of the statuettes are those of hermaphrodites. This was a recognition of a dual godhead, which, unknown in the palæolithic era, seems to have become established during the neolithic age. In general, the large-breasted tradition continues throughout the palæolithic and neolithic periods. Today these ancient works have a modern representation in the statuary of peoples so far apart as the Finns and the Ainus. In the main, adiposity and the large pendulous breast are characteristic of the art of the palæolithic era. In the reindeer age, it has been said, maternity was the obvious reason for woman's existence. Hesiod has sung in the *Theogony*: "Before all things was Chaos, and then Gaia of the large breasts." The images found in funerary mounds and cromlechs, whilst their faces are in many instances scarcely indicated, have always large, pendulous breasts. The same tendency in sculpture may be traced through the copper, bronze and iron ages up to the dawn of recorded history.

Within the bounds of historic time Nature is symbolized by the figure of a woman with large and multiple breasts, deified later as the Artemis or Diana of the Latins. The story runs that the divinity, having been born a day earlier than her brother, helped her mother to bring him into the world. As the personification of virginity and chastity, she was later revered as the goddess presiding over childbirth. The Artemis of Ephesus, whose cult had more adherents than any other in

[1] "*L'Esthétique Mammaire à travers l'Histoire*", Dr. Claoué and I. Bernard.

Asia Minor, was never represented as a virgin; she figured always as a mother and her body bristled with secondary nipples. She was the nurse of all earthly beings, and from the lower part of her abdomen and thighs emerged the heads of stags, bulls, lions and other beasts.

Vedic mythology tells of savage combats waged by the Hindu god, Indra, against the powers of darkness for the ownership of the heavenly cows, whose breast milk watered and fertilized the earth. Their breasts were the billowing clouds and their milk the life-giving rain. Many other divinities of antiquity were represented as having not two, but many breasts. Isis, Aphrodite and Ceres belonged to this group, presiding over the fecundity and the food of the children of men.

The artists of the early Egyptian dynasties pictured woman as the possessor of insignificant breasts; by the days of the twenty-sixth to thirtieth dynasties, however, the glands were again shown as greatly enlarged and covering the whole front of the chest. This exaggeration was also a feature of Ægean art and was increased by the wearing of massive corsets which constricted the waist and produced a condition of steatopygia. From archaic Greek art we have a legacy of statues draped in some clinging material which allows the form of the breasts to be clearly outlined. Here the breasts are under-developed and are kept apart by a species of baldrick or cross-belt. It is remarkable also that the nude statuary of this time also represents the female mammary glands as small and widely separated. What is still more curious is that certain sculptors of this epoch show the male breast as greatly hypertrophied, the condition known today as gynæcomasty. Certain such examples are to be seen in the Louvre and in the Uffizi Gallery at Florence. In the age which followed, Greek art reached its apogee in the work of Phidias and Praxiteles. These men showed the female form in its most beautiful and natural aspects. The later Græco-Roman school saw a change in taste in which a desire for realism went so far as to admire the shrunken and wrinkled breasts of old age.

With the advent of Christianity an army of pagan divinities vanished at one blow. The new religion launched an attack at once upon her whom it considered the most dangerous: Venus, the naked woman, the cause of original sin. The body of Eve was early pictured and described as asexual, its outlines identical with those of Adam's figure. The breasts of both were slack and limp. The wish to make woman ugly is also found in a debased form in Byzantine art. With the foundation of religious orders the rules of morality were strictly enforced; sculptors were made to illustrate in stone the penalties of sin, particularly of those attaching to the lusts of the flesh. Thus may be explained the toads, dragons and serpents which are to be found attacking wrong-doers, and particularly the nipples of wrong-doers, in many ancient churches and cathedrals. And yet in many religions milk has been regarded as having miraculous powers. When Juno suckled Hercules she allowed a drop of milk to fall and thus the Milky Way was formed. For the Hindus all things had their beginning in a sea of milk. Ancient Christian mythology regarded milk as the symbol of purity, a life-giving fluid capable of succouring those at the point of death. There are many examples in stone of saints and martyrs who so fed and saved the lives of the faithful.

All who have seen reproductions of the pictures will remember the opulent breasts of Rubens's sitters, and the overwhelming paintings of Joardens and Steen. In eighteenth century England women wore gauzy, light dresses plainly revealing the wearer's outlines. A caricature of 1796 shows "the fashionable mother, or the convenience of modern dress". The drawing depicts a woman of fashion who, on the point of leaving for some social gathering, is hastily feeding her child. Her breast protrudes from a pouch in her dress, the infant being held in a suitable position by a servant.

We have seen that in prehistoric times breasts were shown as of enormous proportions and were symbols of fecundity and reproduction. Much Greek and Roman art did honour to the young girl and the young married woman. The art of the middle ages looked upon the breast not only as the emblem of maternity, but of vice. Then came a long period during which, though artistic conceptions varied in details, the breast was shown in a position more or less correct anatomically and more or less true in proportion. Before the Great War it was held desirable for women to be soft and rounded in form—a fashion which shows present signs of a renascence. But after 1914 conceptions of masculine bravery led women themselves to prefer masculine outlines, to cultivate flat breats and to become devotees of the cult of "slimming". Dr. Leonard Williams relates that when the cult of the curveless figure was at its height a young woman demanded that a surgical friend of his should amputate her breasts, which were perfectly normal. When the surgeon very properly refused, the young woman assured him that two of her friends had had their breasts removed. Dr. Williams also comments upon the fact that it is not uncommon for reputable French surgeons to remove parts of the large breasts which are so common among certain European women at the menopause. These operations have been described in French medical journals of the first rank, and one such article shows an illustration of an instrument devised by the author for the transplantation of the nipple into a new position. Such operations cannot yet be said to be common or popular in the surgical world of Anglo-Saxon countries. Some such procedure might have been justified in the case of Anne Boleyn, who, according to historical report, had three breasts. Catherine de Medici was another famous woman similarly endowed. She was the possessor of an accessory breast in the inguinal region and is said to have designed a special dress for its proper display.

Abstracts from Current Medical Literature.

PÆDIATRICS.

Artificial Pneumothorax in Children.

Christopher Rolleston (*The British Journal of Children's Diseases*, April-June, 1936) reports five cases of artificial pneumothorax in children, whose ages ranged from thirteen to fifteen years. In one patient pregnancy occurred as a complication of the course of treatment three years after the pneumothorax had been induced. She was delivered of a healthy child and her general condition remained excellent. She gave birth to a second child five years later and continued in very good health. In another patient tuberculous glands, which formed abscesses requiring surgical treatment, complicated ulcerative pulmonary disease. When seen thirteen years after treatment she was a healthy-looking young married woman, the only sign of disease being blowing breath sounds under the right clavicle. The author concludes that in unilateral disease artificial pneumothorax is as applicable to children as adults, and the tendency to effusion seems less than in patients over twenty years of age, few of whom escape effusion of some degree.

The Treatment of Chorea.

Harry R. Litchfield, Joseph Gillman, Ellis H. Harris and Benjamin B. Cohen (*Archives of Pediatrics*, April, 1936) review the treatment of chorea. They draw attention to the variable results obtained by drug therapy. The pathology of chorea is not known, although the central nervous system and motor areas of the cortex are most likely the seat of the morbid processes. The authors review the literature in regard to "Nirvanol" therapy and draw attention to the dangers and limitations in the treatment of chorea with this drug. They report a definite improvement in the condition of a girl of eleven years with chorea who was treated with "Luminal", a start being made with 0·03 gramme (half a grain) three times a day, and the dosage being gradually increased until she was taking 1·32 grammes (22 grains) a day. She was on this medication for a month. The authors consider that typhoid vaccine therapy has given them fairly good results, and they report a series of eight patients treated by this method. In practically every case the results were very encouraging and the improvement more rapid than by other methods. Sedatives had been tried in most of these cases without any effect. "T.A.B." vaccine was used; a dose was given each day for seven to nine days, about 0·05 cubic centimetre being used as a primary dose and 0·8 cubic centimetre as a final dose. A sharp rise in temperature resulted from most of the doses, followed by chills and a drop of the temperature to normal.

The Shoulder Sign.

Samuel M. Weingrow (*Archives of Pediatrics*, June, 1936), in the course of his investigation of the scapular reflexes, felt that the multiplicity of muscular reflex associations in the regions of the shoulder might offer something of diagnostic importance. After observing the reactions obtained by tapping the shoulder of normal patients and of patients suffering from disease of the pyramidal tract, the author became convinced of its value as a sign of pyramidal tract disease. To obtain the reflex, the arm, forearm and hand are kept in their normal position, but preferably at rest in the patient's lap. Tapping of the acromial end of the scapula or the coracoid process produces a slight flexion of the forearm and a slight internal rotation of the hand. This type of reflex reaction should be of particular interest to the pædiatrician, because the Babinski toe sign is elicited in the normal child up to six years of age, and there may be doubt as to the result of the test. There is, furthermore, a great deal of disagreement among authorities as to what constitutes a Babinski sign. Case reports are given illustrating the value of the shoulder sign.

The Oral Administration of Pituitary Extract.

Louis A. Lurie (*Archives of Pediatrics*, June, 1936) reports two patients with *dystrophia adiposogenitalis* who were treated with pituitary extract given by mouth with striking results. Two grains of desiccated whole-gland pituitary were administered three times a day for a period of six to twelve months. In neither instance was the patient given a rigid diet, restriction being made only in carbohydrates and fluid. The author points out that an impression has become widespread that, with the exception of thyreoid extract and possibly theelin, none of the glandular preparations is efficacious when given by the mouth. This attitude may simply be a reaction to the extravagant and irresponsible claims made by various pharmaceutical houses; or it may be that many investigators feel that when glandular products are given by mouth the active substances are either destroyed by digestive secretions from the gastro-intestinal tract or are not absorbed. The case reports show what may be accomplished through the oral administration of extract of pituitary gland in properly selected cases without recourse to drastic limitations of caloric and fluid intake. Both patients (boys) lost in weight, and their desire for food, especially carbohydrates and water, returned to normal. The headaches disappeared. Pubertal changes were brought about. Their sluggishness and general phlegmatic attitude disappeared, and they became mentally more alert. Further, it was observed that withdrawal of the medication was as a rule followed either by a gain in weight or a failure to lose in weight. Finally, it is pointed out that poor diagnosis as well as poor and ineffective preparations have been responsible in many cases for failure to obtain good results with organotherapy.

Skin Tests in Rheumatic Fever Children.

Valentia P. Wasson (*Archives of Pediatrics*, May, 1936), in the course of routine investigation of every new case of rheumatic fever referred to the Fifth Avenue Hospital Clinic, has studied the results of skin tests done to determine the sensitivity to hæmolytic streptococucs nucleoproteins. The test was done by injecting 0·1 cubic centimetre of the material intradermally into the flexor surface of the forearm. The result was read 48 hours later. All reactions less than 5·0 millimetres in diameter were regarded as no reaction. Only the area of induration and not the areola was measured. A group of 137 rheumatic children were tested in this way, and 90 non-rheumatic children were tested with the same material; 79·4% of the rheumatic children reacted and 20·6% did not react. In the control group, 28·88% gave a positive reaction and 71·12% no reaction. The test cannot be considered diagnostic of rheumatic fever; but a positive skin test strongly suggests rheumatic fever. In the rheumatic fever group the frequency of positive reactions increased steadily with the age of the patients. The severity of the reaction was also greater in older children. There was no correlation between the intensity of the skin test and the severity of the cardio-vascular disease.

Vitamins A and D in Measles.

Helen M. M. Mackay, Hilda M. Linford, Maurice Mitman and Mary H. Wild (*Archives of Disease in Childhood*, June, 1936) investigated the effect of giving vitamin *D* and vitamin *D* plus vitamin *A* to children under thirteen years of age with measles at the North-Eastern Hospital, London. The 697 cases were divided into three groups. The first group served as controls and had the ordinary ward diet only. The second group received in addition 3,000 international units of vitamin *D* daily as an emulsion of calciferol. The third group received the same amount of vitamin *D* with, in addition, vitamin *A* equivalent to 24 cubic centimetres (six drachms) of cod liver oil of a blue value of 7·5. The children were fairly evenly divided between the three groups as regards age, incidence of pneumonia, and incidence of otor-

of otorrhœa. A comparison of the fatality rates, of the incidence of pneumonia, of otorrhœa, of all complications, and of skin lesions developed in hospital, as well as a comparison of the duration of pyrexia or length of stay in hospital, affords no evidence of any favourable effect achieved in the course of the disease by giving either vitamin *D* or vitamin *D plus* vitamin *A*. It is pointed out that this result may be due to: (i) the shortness of the time of observation (average under twenty days), and (ii) the lateness in starting the treatment, since in 81% of the cases treatment was not started until after the appearance of the rash, say till the fourth day or later in the disease.

ORTHOPÆDIC SURGERY.

The Treatment of Atrophic Arthritis.

W. P. HOLBROOK AND D. F. HILL (*The Journal of the American Medical Association*, July 4, 1936) discuss the treatment of atrophic arthritis. They emphasize the absence of any specific cure and the necessity of using a comprehensive programme of management, including correction of diet, bowel management, rest, exercise, prevention of deformity, general physical therapy and climatic residence. They regard heredity, infection, climate, fatigue, trauma, exposure, nervous strain, circulatory disturbance, gastro-intestinal dysfunction and endocrine disorders as ætiological factors; therefore, treatment, if it is to be successful, must depend on a programme utilizing every available therapeutic aid. Local treatment should aim at maintenance of muscle tone, retention of joint movement, and prevention of deformities. The diet should be adjusted to the needs of the individual patient, a high calory and high vitamin diet being given if the patient is under weight, and low starch and low fat diet for the obese. Bread and pastry eaters rarely eat enough vitamin and mineral-containing food. Adequate intestinal elimination is secured without cathartics. Removal of foci of infection should be undertaken early if it is to be of benefit; but regard should be paid to the hazardous nature of this procedure, every attempt being made to raise the patient's resistance by rest, blood transfusion and increase of weight, first. The authors continue using autogenous vaccines in minute doses, intravenously or subcutaneously, but have an open mind regarding their value. Blood transfusion is of great value in building up the patient and arresting the disease. Drugs, such as salicylates, hydrochloric acid, arsenic and iron, are of value; but sulphur and gold are disappointing. Vitamins have been of value; but hopes for the value of fever therapy have not been realized. Physical therapy consists largely in postural correction, assistive exercises and corrective exercises; massage and heat are used only until active exercises are possible. Flexion deformities should be prevented by rest without pillows on a bed that does not sag. All painful joints should be splinted as far as possible in extension. Chest and abdominal exercises and full passive movements of each joint should be practised daily. Manipulations followed by retention in plaster should be performed if deformities resist the above measures.

Reconstruction of the Digital Tendon Sheath.

L. MAYER AND N. RANSOHOFF (*The Journal of Bone and Joint Surgery*, July, 1936) describe a new method for providing a gliding mechanism in transplantation and repair of damaged finger tendons. In the treatment of traumata to the finger tendons one great difficulty arises from the adhesions that bind the distal stumps of the flexor tendons to one another and extend up to the proximal end but destroying the smooth cells on the surface of the tendon and its sheath. If there has been even a mild infection the degree of damage is proportionately increased. The authors have adapted the work of Prime, who discovered that chemically pure celloidin, if used to prevent adhesions following operations upon the brain, became coated with smooth tissue whose flattened cells resembled those lining the wall of the tendon sheath. They describe their method of preparing celloidin tubes of varying sizes corresponding to the tendon sheaths of different hands. These celloidin tubes are kept in a solution of distilled water until the time of the operation, when they are sterilized by immersion in a 1 in 2,000 solution of oxycyanate of mercury for no more than twenty minutes. The operation is done in two stages, the first of which consists in a complete resection of the scarred tendon sheath and damaged tendons, and the implantation of the celloidin tube of appropriate size, which must reach from the proximal stumps of the tendon to the distal attachment of the *flexor digitorum profundus* at the base of the distal phalanx, precautions being taken to see that the incision in the skin follows the normal creases of the palms and fingers. The proximal stumps of the tendons are fixed to the proximal ends of the celloidin tube by a stitch, and the distal stump of the *flexor digitorum profundus* tendon is similarly anchored to the distal end of the tube, which thus occupies the space left by the resection of the tendon and the scarred sheath. The subcutaneous tissues are united over the tube by a series of interrupted sutures, the skin being united by similar sutures, and a light splint is applied to fix the finger that has been operated upon. The second stage of the operation, which is performed from four to six weeks later, consists in a small incision down to each end of the tube, through which a probe, threaded with a silk guide suture, is passed; the tube is then withdrawn from the finger, leaving the guide suture in place. In every instance the tube has been found completely enveloped by a smooth, glistening membrane, whose surface closely resembles the normal lining of a tendon sheath. The remaining steps of the operation, including the implantation of a free tendon graft, are similar to those described in Bunnell's work, care being taken to insure that the tendon is sutured at its correct length. The details of the after-treatment are regarded by the authors as being no less important than those of the operation. The finger is splinted, and passive motion is begun on the seventh or eighth day, followed by active exercises combined with sinusoidal stimulation of the muscles on the ninth or tenth day. The physiotherapy must be continued for many weeks until function has been regained.

Treatment of Chronic Osteomyelitis.

B. ARMSTRONG AND T. F. JARMAN (*The Journal of Bone and Joint Surgery*, April, 1936) describe the treatment of chronic osteomyelitis by the method of applying Thiersch grafts to cavities and recesses on a mould of Stent's dental composition which exactly fits the cavities to be grafted. They have applied this method to promote rapid epithelialization and healing of bone cavities left after radical operation for chronic osteomyelitis, and they are of the opinion that it prevents the persistence of multiple points of discharge on the surface of the granulation tissue left after the stage of saucerization of the diseased area which is a necessary preliminary in the treatment. After saucerization and suture of the margins of the skin incision to the periosteum and fascia along the border of the cavity, the dressings are changed every two days for six days and then the wound is dressed daily and washed out with sterile saline solution until the cavity is lined by healthy-looking granulation tissue. The dental composition is sterilized by immersion in an aqueous solution of mercury biniodide and is rendered malleable by immersion in hot water; the malleable mass is inserted into the cavity and made to apply itself to all parts of the cavity and allowed to set hard. This mould is now covered with Thiersch graft, the deep surfaces uppermost, and is reinserted into the cavity, gentle pressure being maintained on the mould by means of adhesive strapping. The mould is allowed to remain in position for ten days, at the end of which time the Thiersch grafts will be found to be living and attached to the granulation around the walls of the cavity. The cavity is lined with fairly thick skin in from four to ten weeks, and with the passage of time a certain amount of subcutaneous tissue is deposited beneath the epithelium.

Special Article.

SOME METHODS OF DIAGNOSIS OF EARLY CANCER.

Of the many attempts that have been made to find a specific test for the diagnosis of cancer in its early stages but few have survived the test of time. Clinicians, biologists, chemists and physicists have independently and conjointly proposed a host of methods, most of which have been shown by later experiments to yield insufficiently decisive results. There are some tests, however, for example those of Fuchs, Sehrt, Klein and Links, which have been applied to a great many cases with a considerable measure of success. These tests are based on certain known characteristic properties of the red cells (Sehrt), fibrin (Fuchs), or serum (Klein and Links) of the blood of cancer patients.

The Cancer Disposition.

The fundamental assumption which underlies these methods is that there is a cancer disposition of the blood in cancer patients and that no malignant tumour can form unless this disposition has manifested itself.[1] This assumption has been definitely established in the case of mice by numerous workers, and is inferred to hold also in the case of human beings. Whereas it was at one time believed that the tumour was the primary manifestation of cancer and that products of its metabolic processes subsequently produced aberrations in the blood, it is now believed by many workers that the tumour is preceded by the cancer disposition. It is clear that when once the tumour has begun to form, the composition of the blood will become further affected and secondary indications will betray themselves. It is important, therefore, to distinguish between these primary and secondary manifestations and to make use only of the former in any actual method of diagnosis of early cancer. Much confusion has been caused in the past by a failure to recognize this fact.

A difficulty also arises in that a definite test may indicate a cancer disposition, whereas no malignant tumour may yet be discoverable clinically. The most satisfactory test, then, is one in which no negative results are obtained when the malignant tumour is definitely known to be present. It does not follow that a malignant tumour will form in a patient in whom the cancer disposition has been detected, but there is a danger that it will do so eventually. It will be recollected that to explain the specificity and the transmissible specificity of the fowl tumour Gye[2] suggested that the virus could not by itself infect a cell, but that to do so it had to be associated with a second, chemical, factor; this second factor determined the type of tumour which would be produced by the virus. Lockhart-Mummery[3] concludes that the difference between a simple and a malignant tumour is due to some biochemical property peculiar to the malignant cell. To gain an insight into the primary chemical changes in the blood we must refer briefly to some of Warburg's important discoveries.[4,5]

Warburg's Results. Fischer-Wasels's Experiments.

In 1923, and later, Warburg made known the results of his researches into the metabolism of cancer cells. He showed that the chief process involved was that of glycolysis. His studies were concerned with the two most important sources of energy of the living cell, "respiration and fermentation" (oxidation and glycolysis). Very close relationships were found to hold between the structure and the respiration of cells with regard to the amount of oxygen consumed.

Warburg demonstrated that the consumption of oxygen in a cancer cell is decreased, whereas the glycolytic action is increased 70 or 80 times as compared with that of a normal cell. Moreover, in contrast with the normal cell, this greatly increased glycolysis is maintained by the tumour cell, even in the presence of oxygen; in the normal cell, which also manifests anaerobic glycolysis, this action is discontinued immediately when sufficient oxygen is available. The cancer cell thrives essentially at the expense of a "fermentative" process (in Warburg's sense). For example, a rat carcinoma may oxidize only one out of every thirteen molecules of sugar supplied and will then cause fermentation of the other twelve molecules, producing lactic acid from them. After Warburg's discovery (that there is a great decrease in the oxidation processes and an increase in both the aerobic and the non-aerobic glycolysis of the cancer cell) had been confirmed by numerous other workers,[6] Fischer-Wasels[6,7] and Büngeler[8] set themselves the task of finding out whether the oxidative and glycolytic conditions that characterize the cancer cell likewise obtain in the whole body of an animal which has a malignant tumour, the object being to gain information about the vexed question of "tumour disposition". Their researches disclosed that in the organs (for example, skin, liver, kidneys) of mice with spontaneous tumour growths there was a very marked decrease in the oxidative processes and an increase in the anaerobic and aerobic glycolysis. They also showed that similar and equally pronounced metabolic disturbances occurred in the organs of animals that had been subjected over a prolonged period (at least 120 days; this time is the equivalent of at least ten years in the life of a man[9]) to chronic tar or arsenical poisoning, that is, in the organs of animals in which a general cancer disposition had been artificially induced. Moreover, it is remarkable that an aerobic glycolysis occurs in organs which normally do not exhibit this form of glycolysis (namely, "fermentation" in spite of the presence of oxygen). In this way Fischer-Wasels and Büngeler succeeded in showing not only that the metabolism of the tumour cell itself is changed pathologically, but also that the general cancer disposition is associated with metabolic disturbances in the whole system that resemble closely those discovered by Warburg.

It was only after Yamagiwa and Ichikawa[10] had succeeded (in 1916) in showing that cancer could be induced in mice, by painting some definite area of their skin with tar for some months, that the attention of investigators was called to the general effects of the tar. Bierich and Möller,[11] Lipschütz,[12] Mertens[13] and others showed that the damaging effects of the tar to the whole system played an important part in the genesis of the tumour. Fischer-Wasels and Büngeler showed that by painting the tar on different areas of the skin of the mice instead of on only one area, a certain condition was induced in the animal such that if any part of it was seared with a burn, which would not of itself cause a tumour to grow, a lively process of regeneration would come about and in many cases papillomata and genuine infiltrating squamous-cell epitheliomata would arise. The results of these experiments were confirmed by other workers (Kreyberg,[14] Bloch,[15] Akimoto,[16] Beck,[17] Döderlein[18]), some of whom introduced modifications (intraperitoneal, intravenous or rectal absorption of tar, arsenical poisoning and so forth). Spontaneous growths often arose in parts that had not been painted at all (Krotkina,[19] Clara Lynch,[20] Schabad[21]). As emphasized by Braunstein,[1] there can be no doubt that a general constitutional tumour disposition can be induced by the effects of tar, arsenic and some other carcinogenic substances. This brief account may serve to justify the application of those methods of diagnosis which depend on the existence of the cancer disposition. This disposition may be inherited[22] or may be acquired. It is clear that precise knowledge of the composition of the blood of cancer patients must be of great value in determining the stage or the progress of the disease. A comprehensive and regularly repeated survey of the blood of many cancer and non-cancer patients is indicated. This principle has recently been adopted by J. Loiseleur at the *Laboratoire Institut de Radium*, Paris.

Before discussing the diagnostic tests it must be mentioned that radiation treatment of any kind, many drugs and also diet may cause temporary changes in the blood which may vitiate the results of these tests. The blood must therefore be taken from the patient fasting, and any

treatment to which the patient may have been subjected must be known and taken into consideration.

Sehrt's Indophenol Blue Test.

On the basis of Warburg's findings Sehrt[25] has proposed a method of diagnosing cancer by determining colorimetrically the amount of indophenol blue formed by the blood under certain conditions. We cannot here describe the details of the theory on which Sehrt has built up his method. The actual test,[26][27] which is supplemented by a second simpler test, given below, is as follows.

The blood is taken from the fasting patient, insulin (10 to 20 units) having been previously administered subcutaneously as a safeguard against the increased blood sugar content which often occurs in cancer patients (remarked on by Freund in 1885; compare also Woodward and Fry[28]), which has been found to affect the measurements. Dark venous blood is drawn off, part of it being taken up in a hæmoglobinometer tube and a part under ether (to remove fats) into a Hahn reagent tube, provided with a glass bead, until it is filled to almost one-fifth of its length. This tube is closed with glass stoppers (air bubbles being avoided) and is vigorously shaken for eight minutes. In the meantime the blood in the hæmoglobinometer, which has been diluted with N/10 hydrochloric acid solution in an Autenrieth-Königsberger colorimeter, is measured in Sahli percentages exactly forty-seven minutes after the blood has been drawn. Next, the sample of blood which has been kept under ether is shaken up and then run into several tubes containing ether, which are centrifuged for ten minutes. Other tubes are now made up to 5·0 cubic centimetres with equal quantities of fresh dimethylparaphenyldiamin base solution (0·1 gramme in 20 cubic centimetres of 0·9% sodium chloride solution, free of oxygen, at room temperature) and α-naphthol solution (0·6 gramme in 120 cubic centimetres of oxygen-free 0·9% sodium chloride solution); 10 cubic millimetres of the red cells and 50 cubic millimetres of 5% ammonia solution are run into this mixture, causing hæmolysis. The tubes are closed with glass stoppers, air bubbles again being avoided, and after thirty-seven minutes the colour of the solution is compared in monochromatic sodium light[29] with a calibrated blue wedge. Corresponding to a definite quantity of hæmoglobin, there is a definite amount of indophenol blue formed; this colour is found to be increased in the case of cancer patients. This increase occurs because the oxygen available to the red cell is less consumed in consequence of the decreased respiration of carcinoma cells; that is, there is a lower degree of effective oxygen absorption in the venous blood of cancer patients.

In 500 cases the test yielded 82% correct results, 10% wrong results, and 8% were indefinite. In a recent paper Sehrt[30] compares his results statistically with those obtained by other methods, and states that by first removing the fats from the blood and decreasing the blood sugar he has obtained 100% correct results in thirteen cancer patients and 12% positive results in non-cancer cases; the latter result agrees with that obtained by other methods and is, in Sehrt's opinion, not due to faults in the method, but is due to the fact that it also detects the cancer disposition. Thus relatives of cancer patients were also often found to yield positive results. Moreover, in eight of these positive cases a malignant tumour later developed.

Sehrt's Retarded Hæmatin Test.

A second, much simpler, test has also been devised by Sehrt.[27] It is founded on the same principles as his first test and is called by him the *Hæmatinverzugprobe* (retarded hæmatin test). It is essential that the patient under examination should not recently have been treated surgically nor have been irradiated. Blood is drawn off from the fasting patient, no food having been given in the preceding twelve hours; undue loss of fluid from the patient must be avoided (aperients must not be given); the rectal temperature must not exceed 37·8° C.; twenty units of insulin must be administered two hours before the withdrawal of the blood. Dark venous blood must be taken. Four special pipettes must be filled in rapid succession to the mark 20 cubic millimetres and then must be made up to two cubic centimetres with N/10 hydrochloric acid and immediately mixed by shaking with the glass bead of the pipette. After five minutes, as measured by a stop watch, the colour is read off in a colorimeter and a second reading taken after forty-seven minutes. In normal and non-cancer cases it is found that the Sahli percentage is initially, say, 70·4 and that after forty-seven minutes the suspension has darkened, say, to 76% or 78%. The blood of cancer patients, however, behaves very differently. The darkening is almost imperceptible and rises from, say, 70·4% to less than 73·5%, in exceptional cases to 74·0% (after two hours). The same result as for cancer is obtained in the case of pregnancy, and to distinguish between them it may be necessary to carry out an Aschheim-Zondek test as well. Sehrt first used an Autenrieth-Königsberger hæmoglobinometer in the retarded hæmatin test. He attained an accuracy of 93% in 637 cases, of which 160 were cancer cases. In his latest communication Sehrt[30] mentions that he now uses a specially designed photo-electric colorimeter, which has increased the accuracy of the method. This method claims to detect squamous-cell epitheliomata and laryngeal and œsophageal carcinomata, which often elude other tests. In a footnote to one of Sehrt's papers[27] the editor of the *Münchener medizinische Wochenschrift* recommends that Sehrt's simple test be tried in as many institutions as possible.

The Freund-Kaminer Reaction.

The earliest method of investigating blood which has some claim to be regarded as being specific for cancer is based on a reaction discovered in 1910 by Freund and Kaminer.[29] In contrast with many other tests, it involves the use of cells of malignant tumours. According to these authors, the blood serum of a normal patient causes a lysis of malignant cells when incubated with them under sterile conditions, whereas the serum of carcinomatous patients lacks this lytic power. This reaction, known on the Continent as the Freund-Kaminer reaction, was discovered almost simultaneously by C. Neuberg.[30]

According to H. J. Fuchs,[31] this reaction is not sufficiently specific for diagnostic purposes, for the following reasons: (*a*) Sera with an excess of tumour antibodies destroy cancer cells, sometimes more actively than normal sera, in which it is known that specific cancer cell antibodies are absent. (*b*) Some non-cancer sera are likewise unable to destroy cancer cells. (*c*) Sera of patients in whom antigens of embryonic cells have passed into the blood stream do not destroy cancer cells at all or have only a slight destructive effect on them. This may occur in the case of pregnant patients. (*d*) Hereditary causes may also yield sera that do not destroy cancer cells.

These objections make it clear that the Freund-Kaminer reaction in its original form lacks uniqueness. A further difficulty is encountered owing to the fact that the test material, the cancer cells, are not easily available in a standard form over a long period. These obstacles, which have since, however, been largely overcome (see Klein's test below), led Fuchs to devise a new method, based on an apparently more specific property of cancer serum, which will be described later. An attempt was made by Abderhalden[32] to overcome the instability of the test material by preparing dried standards of cancer cells; but the method of preparation caused changes in the cells which did not improve the specificity of the reaction. Other technical modifications by Abderhalden[33] (ninhydrin reaction for determining the amount of amino-acids) failed to yield more successful results.

A Modified Abderhalden Test.

Recent modifications of Abderhalden's method have been suggested by Mertz and von Lüttge;[34] and the last of these is a method of flocculation by means of phosphotungstic acid. It is described and discussed critically by S. Zuech.[35] The method is as follows. One cubic centimetre of venous blood is taken from the patient (fasting) and is treated with one cubic centimetre of a 2·8% aqueous solution of